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Atlantic Coast Pipeline and Supply Header Project

Final Environmental Impact Statement

Volume I

Atlantic Coast Pipeline, LLC
Dominion Energy Transmission, Inc.

Docket Nos. CP15-554-000, CP15-554-001, CP15-555-000, and CP15-556-000
FERC/EIS-0274F

Cooperating Agencies:

U.S. Department of Agriculture – Forest Service	**U.S. Army Corps of Engineers**	**U.S. Environmental Protection Agency**	**U.S. Fish and Wildlife Service**	**West Virginia Department of Environmental Protection**	**West Virginia Division of Natural Resources**

July 2017

This environmental impact statement was prepared by the staff of the Federal Energy Regulatory Commission to assess the potential environmental impacts of the Atlantic Coast Pipeline and Supply Header Project (Docket Nos. CP15-554-000, CP15-554-001, CP15-555-000, and CP15-556-000), proposed for construction in West Virginia, Virginia, North Carolina, and Pennsylvania. The cooperation and assistance of the U.S. Department of Agriculture – Forest Service; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; U.S. Fish and Wildlife Service; West Virginia Department of Environmental Protection; and West Virginia Division of Natural Resources was greatly appreciated.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
401 WQC	401 Water Quality Certification
ACHP	Advisory Council on Historic Preservation
ACP	Atlantic Coast Pipeline
ACRES	Assessment, Cleanup and Redevelopment Exchange System
ACS	American Community Survey
ACUB	Army Compatible Use Buffer
AFSA	anadromous fish spawning areas
AIS	aquatic invasive species
AMSL	above mean sea level
ANST	Appalachian National Scenic Trail
APE	area of potential effects
AQCR	Air quality control regions
ARD	acid rock drainage
ARPA	Archaeological Resources Protection Act
ASMFC	Atlantic States Marine Fisheries Commission
ATC	Appalachian Trail Conservancy
Atlantic	Atlantic Coast Pipeline, LLC
ATV	all-terrain vehicles
ATWS	additional temporary workspace
AWS	wildlife water supply
B	boating
BA	Biological Assessment
BACT	Best Available Control Technology
BCC	Birds of Conservation Concern
Bcf/d	billion cubic feet per day
BCR	Bird Conservation Regions
BE	Biological Evaluation
BGEPA	Bald and Golden Eagle Protection Act
BIC Team	Best in Class Steep Slope Management Program
BLM	Bureau of Land Management
BMPs	best management practices
BRP	Blue Ridge Parkway
BRP GMP/EIS	Blue Ridge Parkway, Virginia and North Carolina, Final General Management Plan/Environmental Impact Statement
CAA	Clean Air Act
CAN	Conditions not allowable
Capacity Lease	Atlantic's capacity lease on Piedmont's existing pipeline distribution system
CCB	Center for Conservation Biology
cCDs	Corridor Closed Depressions/Features
CCS	carbon capture from the turbine stacks and permanent sequestration
CCVI	Climate Change Vulnerability Index
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CH_4	methane
Class SWL	tidal wetlands

Class WL	freshwater wetlands
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalents
Columbia	Columbia Gas Transmission, LLC
COM Plan	*Construction, Operation, and Maintenance Plan*
Commission	Federal Energy Regulatory Commission
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSR	Code of State Rules
CVSZ	Central Virginia Seismic Zone
CWA	Clean Water Act
CWF	cold water fisheries
CY	Cubic yards
CZMA	Coastal Zone Management Act
dB	decibels
dBA	decibels on the A weighted decibel scale
DBH	diameter at breast height
DOE	U.S. Department of Energy
Dominion	Dominion Resources, Inc.
DOMSP	Dominion South Point
DOT	U.S. Department of Transportation
DPS	distinct population segments
Draft Certificate	Draft Certificate of Satisfactory Completion of Remediation
Dth/d	dekatherms per day
DTI	Dominion Transmission, Inc.
Duke Energy	Duke Energy Corporation
DVP	Dominion Virginia Power
DWR	Division of Water Resources
DWWM	Division of Water and Waste Management
E	esthetics
E2E	Estuarine intertidal emergent
E2U	Intertidal unconsolidated shore wetlands
EA	Environmental Assessment
East Tennessee	East Tennessee Natural Gas
ECOS	Environmental Conservation Online System
EEP	Equitrans Expansion Project
EFH	essential fish habitat
EI	Environmental Inspector
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPAct	2005 Energy Policy Act
Equitrans	Equitrans, L.P.
ERI	electrical resistivity imaging
ESA	Endangered Species Act
ESCGP-2	Erosion and Sediment Control Plan
F	fishing
FEMA	Federal Emergency Management Agency

FERC	Federal Energy Regulatory Commission
FERC *Plan*	FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*
FERC *Procedures*	FERC's *Wetland and Waterbody Construction and Mitigation Procedures*
FHA	Federal Highway Administration
FI	Forest Inventory and Analysis
Fire Plan	Fire Prevention and Suppression Plan
Fisheries	National Marine Fisheries Service
Framework	National Strategic Framework for Invasive Species Management
FS	U.S. Forest Service
FSA	Farm Service Agency
FSM	Forest Service Manual
FWS	U.S. Fish and Wildlife Service
g	gravity
GAP	Gap Analysis Program
GEBS	Gas Environmental Business Support
GeoConcepts	GeoConcepts Engineering, Inc.
Geosyntec	Geosyntec Consultants, Inc.
GHG	greenhouse gases
GIS	Geographic Information System
gpd	gallons per day
GWNF	George Washington National Forest
GWP	global warming potential
ha	hectares
HAP	hazardous air pollutant
HCA	high-consequence areas
HDD	horizontal directional drill
HDD Plan	*Horizontal Directional Drill Drilling Fluid Monitoring, Operations, and Contingency Plan*
HEA	Habitat Equivalency Analysis
hp	Horsepower
HQ	High Quality Waters
HQS	high quality streams
HUC	hydrologic unit code
IBA	Important Bird Areas
INGAA	Interstate Natural Gas Associate of America
IPaC	Information for Planning and Conservation
IRR	Integra Reality Resources
IRS	irrigation
Karst Mitigation Plan	Karst Terrain Assessment, Construction, Monitoring, and Mitigation Plan
KOP	Key Observation Points
KRA	Karst Review Area
kV	kilovolt
LiDAR	Light Detection and Ranging
LNG	liquefied natural gas
LRMP	Land and Resources Management Plan
LRR	Land Resource Region
LUSTs	leaking underground storage tanks
LWCF	Land and Water Conservation Fund
LWS	livestock water supply

M	magnitude
M&R	meter and regulating
MACT	maximum achievable control technology
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act
Merjent	Merjent, Inc.
MIS	Management Indicator Species
MLRA	Major Land Resource Areas
MLV	mainline valve
MMPA	Marine Mammal Protection Act
MNF	Monongahela National Forest
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
Mountain Valley	Mountain Valley Pipeline, LLC
MP	milepost
MRT	Mean Residence Time
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MUSYA	Multiple-Use Sustained-Yield Act of 1960
MVP	Mountain Valley Pipeline
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCAC	North Carolina Administrative Code
NCDEQ	North Carolina Department of Environmental Quality
NCDMF	North Carolina Division of Marine Fisheries
NCDOT	North Carolina Department of Transportation
NCEEP	North Carolina Ecosystem Enhancement Program
NCGS	North Carolina Geological Survey
NCDNCR	North Carolina Department of Natural and Cultural Resources
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants for Source Categories
NETHCS	Northeast Terrestrial Habitat Classification System
NFMA	National Forest Management Act of 1976
NFS	National Forest System
NGA	Natural Gas Act
NGL	natural gas liquids
NHI	Natural Heritage Inventory
NHNA	natural heritage natural areas
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NMFS	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NNSR	Nonattainment NSR
NOA	Notice of Application
NOAA	U.S. Department of Commerce, National Oceanic and Atmospheric Administration
NOI	Notice of Intent to Prepare an Environmental Impact Statement for the Planned Supply Header Project and Atlantic Coast Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings

NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRAC	Natural Resource Analysis Center
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NTSA	National Trails System Act
NWI	National Wetlands Inventory
NWP	nationwide permits
NWR	National Wildlife Refuge
OCM	Office for Coastal Management
ODW	Office of Drinking Water
OEP	Office of Energy Projects
OHV	off-highway vehicle
OHWM	ordinary high water mark
OLS	Office of Lands and Streams
OPS	Office of Protected Species
ORV	outstandingly remarkable natural or cultural value
OSHA	Occupational Safety and Health Administration
P	Primitive
PA Code	Pennsylvania Code
PABHP	Pennsylvania Bureau for Historic Preservation
PADCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PAFBC	Pennsylvania Fish and Boat Commission
PAGC	Pennsylvania Game Commission
PCH	proposed critical habitat
PEM	Palustrine emergent
PFO	Palustrine forested
PGA	peak ground acceleration
PGP	PGP Valuation Inc.
PHMSA	Pipeline and Hazardous Materials Safety Administration
Piedmont	Piedmont Natural Gas Co., Inc.
Pivotal	Pivotal Propane of Virginia, Inc.
Plan	Upland Erosion Control, Revegetation, and Maintenance Plans
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PNHP	Pennsylvania Natural Heritage Program
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
PSCN	Public Service Company of North Carolina, Inc.
PSD	Prevention of Significant Deterioration
psig	Pounds per square inch gauge
PSS	Palustrine scrub-shrub
PURTA	Public Utility Realty Act
PWA	Potential Wilderness Areas
PWS	potable water supply
R	rural
RACT	Reasonably Available Control Technology

RCP	Residential Construction Plans
RFP	requests for proposals
RFSS	Regional Foresters' Sensitive Species
RHA	Rivers and Harbors Act
RN	roaded natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RUSLE2	Revised Universal Soil Loss Equation 2
Rx	management prescription
SAIPR	Slip Avoidance, Identification, Prevention, and Remediation – Policy and Procedure
SBA	Special Biological Areas
SCADA	Supervisory Control and Data Acquisition
sCDs	suspect Closed Depressions
SCU	Stream Conservation Unit
SDWA	Safe Drinking Water Act
SFHA	Special Flood Hazard Areas
SGCN	Species of Greatest Conservation Need
SHP	Supply Header Project
SHPO	State Historic Preservation Offices
SIO	Scenic Integrity Objectives
SMS	Scenery Management System
SO_2	sulfur dioxide
SOP	Site Operations Plan
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SPM	semi-primitive motorized
SPNM	semi-primitive non-motorized
SSURGO	Soil Survey Geographic Database
Steuart	Steuart Investment Company
SUP	Special Use Permit
SVBF	Shenandoah Valley Battlefields Foundation
SWPPP	Stormwater Pollution Prevention Plans
TOYR	time of year restriction
tpy	tons per year
Transco	Transcontinental Gas Pipe Line Company, LLC
TSF	Trout Stocking Fisheries
U.S.C.	United States Code
UNT	unnamed tributary
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UWL	unique wetlands
VA Guard	Virginia National Guard
VAC	Virginia Administrative Code
VaNLA	Virginia Natural Landscape Assessment
VDACS	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health

VDHR	Virginia Department of Historic Resources
VDMME	Virginia Department of Mines, Minerals, and Energy
VDNH	Virginia Division of Natural Heritage
VDOF	Virginia Department of Forestry
VDOT	Virginia Department of Transportation
VLIS	Virginia's Legislative Information System
VMRC	Virginia Marine Resource Commission
VOC	volatile organic compounds
VOF	Virginia Outdoors Foundation
VRP	Voluntary Remediation Program
VSS	Virginia Speleological Society
WBWF	Ward Burton Wildlife Foundation
WEGs	Wind Erodibility Groups
WERMS	Wildlife Environmental Review Map Service
WHPA	Wellhead Protection Area
WIDNR	Wisconsin Department of Natural Resources
Wingina District	Norwood-Wingina Rural Historic District
WMA	Wildlife Management Area
WNS	white nose syndrome
WPCA	West Virginia Water Pollution Control Act
WRS	Wildlife Resources Section
WSR	Wild and Scenic River
WV State Parks and Forests	West Virginia State Parks and Forests
WVCSR	West Virginia Code of State Regulations
WVDCH	West Virginia Division of Culture and History
WVDEP	West Virginia Department of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVDNH	West Virginia Division of Natural Heritage
WVDNR	West Virginia Division of Natural Resources
WVDOF	West Virginia Division of Forestry
WVDOT	West Virginia Department of Transportation
WVGES	West Virginia Geological and Economic Survey
WWF	warm water fisheries

EXECUTIVE SUMMARY

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this final Environmental Impact Statement (EIS) to fulfill requirements of the National Environmental Policy Act of 1969 (NEPA) and the Commission's implementing regulations under Title 18 of the Code of Federal Regulations Part 380 (18 CFR 380). This EIS assesses the potential environmental impacts that could result from constructing and operating the Atlantic Coast Pipeline (ACP) and Supply Header Project (SHP); two separate, but related, interstate natural gas transmission pipeline projects.

On September 18, 2015, Atlantic Coast Pipeline, LLC (Atlantic) and Dominion Energy Transmission, Inc. (DETI) filed respective applications with the FERC in Docket Nos. CP15-554-000 and CP15-555-000 pursuant to sections 7(b) and 7(c) of the Natural Gas Act (NGA) and Parts 157 and 284 of the Commission's regulations to construct, operate, abandon, and maintain natural gas pipeline facilities in Pennsylvania, West Virginia, Virginia, and North Carolina. In addition, on September 18, 2015, Atlantic and Piedmont Natural Gas. Co., Inc. (Piedmont) filed a joint application with the FERC in Docket No. CP15-556-000 pursuant to section 7(c) of the NGA and Part 157 of the Commission's regulations to lease capacity on Piedmont's existing pipeline distribution system (Capacity Lease Proposal).

The FERC is the federal agency responsible for authorizing interstate natural gas transmission facilities under the NGA, and is the lead federal agency responsible for preparing this EIS. The U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), U.S. Department of Agriculture (USDA) – Forest Service (FS), U.S. Fish and Wildlife Service (FWS), West Virginia Department of Natural Resources (WVDNR), and West Virginia Department of Environmental Protection (WVDEP) are cooperating agencies assisting in the preparation of the EIS because they have jurisdiction by law or special expertise with respect to environmental resources and impacts associated with DETI's and Atlantic's proposal.

PROPOSED ACTIONS

ACP would involve the construction and operation of 333.4 miles of 42-inch-diameter mainline pipeline (AP-1); 186.3 miles of 36-inch-diameter mainline pipeline (AP-2); 83.4 miles of 20-inch-diameter lateral pipeline (AP-3); 0.4 mile of 16-inch-diameter lateral pipeline (AP-4); 1.0 mile of 16-inch-diameter lateral pipeline (AP-5); three new compressor stations; and valves,[1] pig[2] launchers and receivers, and meter and regulating (M&R) stations[3] in West Virginia, Virginia, and North Carolina. ACP would be capable of delivering up to 1.5 billion cubic feet per day (Bcf/d) of natural gas to customers in Virginia and North Carolina.

SHP would involve the construction and operation of 37.5 miles of 30-inch-diameter pipeline loop;[4] modifications at four existing compressor stations, one M&R station, and valves and pig launchers and receivers in Pennsylvania and West Virginia. SHP would enable DETI to provide firm transportation service of up to 1.5 Bcf/d of natural gas to various customers, including Atlantic. DETI is also requesting

[1] A valve is an aboveground facility that is capable of controlling the flow of gas in a pipeline.

[2] A pipeline pig is a device used to clean or inspect a pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

[3] A meter and regulating station is an aboveground facility that contains the equipment necessary to measure the volume of gas flowing in a pipeline.

[4] A pipeline loop is a segment of pipe constructed along an existing pipeline to increase capacity.

authorization to abandon in place two existing gathering compressor units at its existing Hastings Compressor Station in Wetzel County, West Virginia.

According to DETI, SHP would provide customers access to the Dominion South Point hub in Pennsylvania along with other interconnecting natural gas suppliers, which allows access to multiple gas suppliers and markets to facilitate access to low cost natural gas. Through natural gas supplies provided by SHP and other suppliers, ACP would serve the growing energy needs of multiple public utilities and local distribution companies in Virginia and North Carolina. Most of the natural gas transported by ACP would be used as a fuel to generate electricity, with lesser amounts used for residential, industrial, commercial, and other uses (e.g., vehicle fuel). In total, SHP and ACP would deliver up to 1.5 Bcf/d of natural gas.

According to Atlantic and Piedmont, the Capacity Lease Proposal would allow Atlantic to service North Carolina markets using additional transportation capacity on the Piedmont system. Use of this capacity would avoid the need for constructing new facilities and eliminate potential over-building and consequent effects on landowners and the environment.

Dependent upon Commission approval and receipt of all other necessary permits and approvals, Atlantic and DETI propose to begin construction in fall 2017, and place the projects in service by the fourth quarter 2019. The applicants would request to place the facilities into service following a determination that restoration is proceeding satisfactorily. We[5] expect an in-service request would follow shortly after the end of construction.

PUBLIC INVOLVEMENT

On October 31, 2014, Atlantic and DETI filed requests to implement the Commission's Pre-filing Process for ACP and SHP. At that time, Atlantic and DETI were in the preliminary design stages of the projects and no formal application had been filed. The FERC established its Pre-filing Process to encourage early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve environmental issues before an application is filed with the FERC and facility locations are formally proposed. The FERC granted Atlantic's and DETI's requests to use the Pre-filing Process on November 13, 2014, and established pre-filing Docket Nos. PF15-6-000 and PF15-5-000 for their projects, respectively.

On February 27, 2015, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Supply Header Project and Atlantic Coast Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI). The NOI was published in the Federal Register and sent to 6,613 parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in ACP and SHP. The NOI requested written comments from the public and announced the time and location of public scoping meetings.

We held 10 public scoping meetings in the project area in March 2015 to receive comments on environmental issues associated with the projects. Additionally, we participated in DETI's and Atlantic's open houses, interagency meetings, conference calls, and conducted site visits to identify issues to be addressed in this EIS. The meetings, conference calls, and site visits provided a forum for the exchange

[5] The pronouns "we," "us," and "our" refer to the environmental staff of the Federal Energy Regulatory Commission's Office of Energy Projects.

of information and supported the FERC's responsibility to coordinate federal authorizations and associated environmental review of ACP and SHP.

On October 2, 2015, the FERC issued a *Notice of Application* announcing that Atlantic and DETI had filed applications with the FERC. The application filings concluded the Pre-filing Process and began the post-application review process for the projects. On March 22, 2016, the FERC issued a *Notice of Amendment to Application* announcing that Atlantic had filed an amendment to its FERC application on March 14, 2016.

As a result of pipeline route modifications that were proposed by Atlantic after the initial NOI, we issued two supplemental NOIs (August 5, 2015 and May 3, 2016) that described each route modification and requested comments from interested stakeholders. In addition, the second supplemental NOI, which was associated with Atlantic's March 14, 2016 amendment, requested comments related to proposed actions of the FS, including potential Land and Resource Management Plan (LRMP) amendments and for issuance of a right-of-way grant for ACP's crossing of the Monongahela National Forest (MNF) and George Washington National Forest (GWNF). The Notices were published in the Federal Register and opened additional formal scoping periods.

We issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed Atlantic Coast Pipeline, Supply Header Project, and Capacity Lease Proposal* on December 30, 2016. The draft EIS was sent to our environmental mailing list. The draft EIS was filed with the EPA, and a formal notice of availability was issued in the Federal Register, which established a 90-day comment period on the draft EIS that ended on April 6, 2017. We held 10 public comment sessions for the draft EIS in February and March 2017. In addition, 1,230 parties submitted a total of 1,675 timely letters in response to the draft EIS. Multiple form letters and petitions were also submitted in response to the draft EIS. Public comment session transcripts and comment letters are available for viewing on the FERC Internet website (http://www.ferc.gov). All substantive environmental comments on the draft EIS submitted to the FERC or made at the public comment sessions are addressed in this final EIS.

PROJECT IMPACTS AND MITIGATION

Construction and operation of the projects could result in numerous impacts on the environment. We evaluated the impacts of the projects, taking into consideration Atlantic's and DETI's proposed impact avoidance, minimization, and mitigation measures on geology, soils, groundwater, surface water, wetlands, vegetation, wildlife, fisheries, special status species, land use, recreation, visual resources, socioeconomics, cultural resources, air quality, noise, and safety and reliability. Where necessary, we recommend additional mitigation to minimize or avoid these impacts. Cumulative impacts of these projects with other past, present, and reasonably foreseeable actions in the project areas are also assessed. In section 3 of this EIS, we summarize the evaluation of alternatives to the projects, including the no action alternative, energy alternatives, system alternatives, facility design alternatives, route alternatives and variations, and aboveground facility siting alternatives.

As a result of the public's involvement in the pre-filing and post-application review processes, we identify and address in this EIS several environmental issues of concern, including karst terrain and steep slopes, public land and recreational impacts, sensitive species, water resources, vegetation and wildlife habitat, socioeconomics, public safety, cumulative impacts, and alternatives. Our analysis of these issues is summarized below. Sections 3 and 4 of this EIS include our detailed analysis of alternatives and additional environmental issues, respectively. Sections 5.1 and 5.2 of this EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Karst Terrain and Steep Slopes

Portions of ACP and SHP would traverse areas that are subject to potential karst development and hazards. Karst terrain is created by the dissolution of carbonate bedrock and is characterized by sinkholes, caverns, underground streams, springs, and other similar features. We received comments from affected landowners, concerned citizens, and public resource managers expressing concern related to construction and operation of the project facilities in karst sensitive areas. Most of these comments concerned the impairment of cave systems, springs, and wells; construction methods triggering sinkhole development; interception of subterranean drainage; and operational safety in karst areas.

ACP would cross 71.3 miles of karst terrain and SHP would cross 1.1 miles of land that has the potential to contain karst features. The most prominent type of karst features in the ACP area are sinkholes, which comprise the greatest potential geohazard risk to any type of construction in karst terrain. Other karst features inventoried in the ACP area include caves and springs. The great majority of the AP-1 mainline that is located through highly karstic terrain would be installed using standard overland construction techniques, which would generally limit disturbance to 6 to 8 feet below ground surface, whereas sensitive groundwater resources and cave systems of public concern are generally found at greater depths. Prior to construction, Atlantic would perform electrical resistivity imagery surveys to detect subsurface solution features along all portions of the route with the potential for karst development; these results would be correlated with boring logs to ensure the analysis reflects the field conditions. During construction, Atlantic would implement its *Karst Mitigation Plan* to address karst features encountered during construction and further reduce the potential to initiate sinkhole development during construction and operation of the facilities. Atlantic would employ a karst specialist to monitor the karst features identified along the right-of-way, monitor for karst features that may form during construction, and make an assessment regarding its potential impact and whether additional mitigation measures would be required. To address requests identified by the Virginia Department of Conservation and Recreation (VDCR), we recommend that prior to completing any geotechnical boring in karst terrain, Atlantic consult with VDCR karst protection personnel regarding each geotechnical boring and follow the Virginia Cave Board's "Karst Assessment Standard Practice" for land development when completing borings.

Constructing and operating ACP in West Virginia and Virginia could induce sinkhole development, alter spring characteristics, and impact local groundwater flow and quality. To ensure that ACP would not significantly impact groundwater and springs, or induce sinkhole development, or be affected by karst features, Atlantic conducted an extensive analysis of geologic conditions in the project area, consulted with the applicable state agencies and local water management districts, and prepared plans to avoid, minimize, and mitigate project-related impacts on these resources. To further identify and assess subsurface bedrock and groundwater flow patterns, we recommend that Atlantic complete a fracture trace/lineament analysis to identify karst features with the potential for intercepting shallow karst voids or cave systems.

ACP would cross the Cochran's Cave Conservation Site, which is designated as a fourth order globally significant conservation site that is known to harbor sensitive species, and could provide ideal habitat for the Madison Cave isopod; however, this species has not been documented in Cochran's Cave. The VDCR concludes[6] that the potential impacts on the cave have been mitigated to the maximum extent practicable based on the studies completed on Atlantic's behalf, the route adjustments made, and Atlantic's commitments to use onsite karst specialists to monitor construction. ACP is also near the

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[6] Email communication from Wil Orndorff (VDCR) on April 6, 2017. The correspondence can be found under FERC Accession No. 20170627-0059 at the following website location: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170627-0059

Burnsville Cove Cave Conservation Site, which is designated as a first order globally significant conservation site. Because the boundaries of the conservation site have not been fully determined by resource agencies, we recommend that Atlantic further consult with applicable resource agencies to minimize potential impacts on the conservation site.

The proposed facilities would be designed, constructed, maintained, and monitored in accordance with modern construction standards and the U.S. Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations, which would reduce the potential for karst conditions to adversely impact the facilities. This is further supported by many miles of similar pipeline facilities that were installed using similar methods and have safely operated in karst-sensitive areas for decades. We also note that other residential, commercial, industrial, and infrastructure development has continued successfully in the karst terrain project areas. While small, localized, and temporary impacts on karst features, water flow, and water quality could occur, the impacts would be adequately minimized and mitigated through Atlantic's and DETI's plans and our recommendations. Potential right-of-way subsidence would be further identified and mitigated by our recommendation to monitor all potential karst areas for subsidence and collapse during years 1, 2, and 5 following construction.

ACP would cross over 84 miles of slopes greater than 20 percent and SHP would cross over 24 miles of slopes greater than 20 percent. Constructing pipelines and access roads in steep terrain or high landslide incidence areas could increase the potential for landslides to occur. Atlantic and DETI have proposed programs and several mitigation measures to minimize the potential for slope instabilities and landslides. Atlantic and DETI developed a Geohazard Analysis Program and is also developing a Best in Class Steep Slope Management Program to address issues of landslide potential and susceptibility. Because analysis, field surveys, and final measures related to slope hazards have not yet been completed for ACP and SHP, we recommend that Atlantic and DETI file the results of its geotechnical studies and geohazard analysis field reconnaissance, and identify mitigation that would be implemented in slope hazard areas during construction and operation of the projects. Also, Atlantic and DETI have developed a Slip Avoidance, Identification, Prevention, and Remediation - Policy and Procedure (SAIPR) to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction.

Atlantic also filed plans, typical drawings, and site-specific designs of representative steep slope construction segments within the MNF and GWNF, including steep slope and side slope construction. Design analysis considered the potential hazards related to temporary trench spoil loss, backfilled soil loss or slip failure, and excess temporary spoil; and then, developed designs to avoid, minimize, or mitigate the potential hazards. The FS would review and approve eight site-specific steep slope designs before construction at these locations could commence. The FS would also require construction monitoring by geotechnical professionals to review implementation of the site-specific designs and any proposed modifications to the designs.

According to the FS, the routing of the ACP corridor and the slope stability design and construction practices would reduce, but not eliminate, slope stability hazards on National Forest System (NFS) lands. The ridgetop routing of 82 percent of the ACP corridor on the MNF and 65 percent on the GWNF would be a major reduction in potential hazards from natural landslides. The Best in Class Steep Slope Management Program and the SAIPR provide design and construction practices that would reduce the potential for project-induced landslides. Despite these major reductions in potential hazards, constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur, including areas outside NFS lands.

Public Land and Recreational Impacts

Construction of the ACP AP-1 mainline would cross the MNF and GWNF, as well as the Blue Ridge Parkway (BRP) and Appalachian National Scenic Trail (ANST). We received numerous comments regarding the proposed crossing of these lands. Specific to NFS lands, the National Forest Management Act of 1976 requires that proposed projects, including third-party proposals subject to permits or rights-of-way, be consistent with the LRMPs of the administrative unit where the project would occur. Because of the continuous linear nature of the pipeline route, it was not possible to be fully consistent with the LRMPs in all locations across federal lands. The FS determined that if the Special Use Permit (SUP) would be approved for the proposed route crossing the MNF and GWNF, the LRMPs would require amendments. These amendments would not change FS requirements for other projects or authorize any other actions.

Atlantic would cross the ANST and BRP using the horizontal directional drill (HDD) method, which would not require ground disturbance or vegetation clearing between the HDD entry and exit points, and would avoid direct impacts on recreationalists' use of the trail and parkway. In the event the HDD crossing fails, Atlantic developed a contingency plan for crossing the BRP and ANST, which involves the use of the direct pipe method to complete the crossing. We and the FS have reviewed Atlantic's *Blue Ridge Parkway and Appalachian National Scenic Trail Contingency Plan* and find it acceptable. However, we recommend that Atlantic continue to consult with the National Park Service regarding these crossing plans and that Atlantic incorporate any substantive improvements identified as part of the National Park Service's review.

The removal of trees would result in a long-term to permanent impact. We recommend that Atlantic identify where a narrowed construction right-of-way would be adopted to reduce impacts on forest land within the Seneca State Forest, MNF, and/or GWNF. Several timber management areas would be crossed by the projects, including the MNF and GWNF. To reduce project-related impacts on merchantable timber, Atlantic and DETI would implement their *Timber Removal Plan*. Atlantic and DETI would conduct timber cruises (i.e., a sample measurement of a stand to estimate the amount of standing timber) prior to vegetation clearing to determine timber volumes, values, and species composition within forested lands, and, in consultation with the land-management agency and landowner, develop site-specific *Timber Extraction Plans* for each area with merchantable timber to be logged. Because timber cruises are pending, we recommend that Atlantic and DETI file their finalized *Timber Extraction Plans* prior to construction.

In general, impacts on recreational and special interest areas would be temporary and limited to the period of active construction, which typically would last only several days to several weeks in any one area, except for linear trails where a detour or temporary closure may be required, or the trail is rerouted to a new area. Atlantic has developed site-specific trail crossing plans, including detour plans, in consultation with trail managers. Atlantic and DETI continue to consult with various agencies and organizations regarding conservation easements such as the Ward Burton Wildlife Foundation, Virginia Outdoors Foundation, and the Westmoreland Conservancy. Atlantic and DETI are coordinating with these entities to identify any specific construction, restoration, and/or operation mitigation measures that would be implemented to promote compatibility with the purpose and values of these conservation easements.

We received comments regarding the visual impacts associated with clearing the construction right-of-way and long-term and permanent tree removal within the operational right-of-way. Pipeline construction and maintenance of the cleared pipeline right-of-way would result in a greater degree of visual impacts in heavily forested areas with high elevations and along steep mountainsides such as in West Virginia and western Virginia. Our recommendation to maintain only a 50-foot permanent right-of-way along the AP-1 mainline would reduce long-term visual impacts. Construction and operation of compressor stations and M&R stations would result in a greater impact on the visual landscape, resulting in conversion of about 130 acres of land to a commercial/industrial facility. Most compressor stations would be visually screened from nearby residences or roadways, located within previously disturbed areas, located within areas with consistent industrial/commercial qualities, and/or located more than 1,000 feet from a residence. We anticipate that visual impacts of the compressor stations on nearby visual receptors during operation would be permanent, but negligible.

ACP would cross scenic byways, which would cause permanent visual impacts that result from tree removal and maintenance of the pipeline facilities. We recommend that Atlantic file site-specific visual mitigation measures for each scenic byway crossing developed in consultation with the DOT, Federal Highway Administration, West Virginia Department of Transportation, Virginia Department of Transportation, VDCR, and North Carolina Department of Transportation. For NFS lands, Atlantic conducted a draft Visual Impact Assessment, which analyzes the project's impacts on the scenic classifications based on key observation points identified on the MNF and GWNF. The FS would work with Atlantic to incorporate any mitigation measures that may be needed to ensure consistency with LRMP SIO's into the *Construction, Operations, and Maintenance* (*COM) Plan* or SUP.

Sensitive Species

To comply with section 7 of the Endangered Species Act (ESA), we consulted either directly or indirectly (through Atlantic's and DETI's informal consultation) with the FWS, U.S. Department of Commerce, National Marine Fisheries Service (NMFS), FS, and state resource agencies regarding the presence of ESA-listed, proposed for listing, or state-listed species in the project areas. Based on these consultations and Atlantic's and DETI's field surveys, and assuming implementation of our recommendations, we determined that construction and operation of ACP and SHP *may affect* and are *likely to adversely affect* seven ESA-listed species (Indiana bat, northern long-eared bat, Roanoke logperch, Madison Cave isopod, clubshell mussel, running buffalo clover, and small whorled pogonia), and would *not likely adversely affect, would not jeopardize,* or have *no effect* on the remaining species identified by the FWS and NMFS. In compliance with section 7, we are submitting this EIS as our Biological Assessment and requesting formal consultation with the FWS and NMFS. Survey access was not available in all cases, agency consultations are ongoing, and/or development of conservation measures are not complete. Therefore, we have several recommendations for Atlantic to file outstanding information for ESA-listed, proposed, or under review species. These include conducting electrical resistivity imagery studies to detect subsurface solution features along karst features within the Madison Cave isopod priority area and within 5 miles of known or survey-identified bat hibernacula; filing additional conservation measures for species and/or suitable habitat confirmed during 2017 surveys; replanting long-leaf pine to mitigate impacts on the red-cockaded woodpecker; and adopting the HDD method at the Neuse River and Nottoway River (AP-1 milepost 260.7) if there is low potential for hydrofracture. We will re-evaluate species determinations with the FWS and NMFS upon receipt of pending survey results and proposed conservation measures. We recommend that construction of ACP and SHP should not commence until consultation with the FWS and NMFS is complete.

Atlantic prepared a Biological Evaluation (BE) to assess impacts on sensitive species on NFS lands, which is under review by the FS. Surveys are ongoing and an effects determination for forest Regional Foresters' Sensitive Species would be reflected in the FS' Final Record of Decision. This EIS also evaluates impacts on MNF and GWNF management indicator species, and GWNF locally rare species. To minimize impacts on these species, Atlantic would implement the *COM Plan,* which will describe the avoidance and minimization measures that would be implemented during construction and operation activities on NFS lands. These measures may reduce potential impacts on certain FS-managed species to varying extents. However, according to the FS, these measures are not intended to achieve site-specific avoidance and minimization impacts of known species occurrences and habitat features that fall within or near the proposed construction footprint. Additional measures are needed to achieve required avoidance and minimization impacts and be consistent with MNF LRMP Standard WF13 and VE13.

Two species of marine mammals (bottlenose dolphin and harbor seal) protected under the Marine Mammal Protection Act (MMPA) may be present in the ACP project area in the Nansemond, James, and South Branch Elizabeth Rivers. No species of marine mammals are present in the SHP area. Atlantic would cross these waterbodies using the HDD method, and water withdrawals would be screened to avoid entrainment or impingement of aquatic species. As such, ACP would not result in harassment of marine mammals and not require an Incidental Take Authorization or Marine Mammal Monitoring Plan under the MMPA.

In addition to ESA-listed and proposed species, several species under review by the FWS, state-listed, or special concern species may be present in the project areas, including bat species and bat hibernacula, snakes, small mammals and amphibians, fish, freshwater mussels, subterranean obligate species, and plants. Species-specific surveys have not been completed for some species, and Atlantic and DETI continue to work with the appropriate state agencies to identify conservation measures for these species (WVDNR; Virginia Department of Game and Inland Fisheries and/or VDCR; and North Carolina Wildlife Resources Commission and/or North Carolina Department of Natural and Cultural Resources).

Water Resources

Groundwater

We received comments expressing concern that groundwater would be adversely affected by the projects. Portions of ACP and SHP through karst sensitive areas would be installed using standard overland construction techniques, which would generally limit disturbance to 6 to 8 feet below ground surface and, thus, not pose a significant risk to groundwater. Atlantic and DETI would not use the HDD method in karst terrain. Based on the proposed construction methods and implementation of project-specific plans and procedures that would avoid or reduce project-related impacts, and considering the tremendous extent and high productivity of the aquifers in the project areas, we conclude that construction and operation of ACP and SHP would not result in a significant impact on aquifers or other groundwater resources. Importantly, natural gas is not miscible in water, unlike oil or refined liquid products. Therefore, if a pipeline incident resulting in a release of natural gas were to occur, the released gas would migrate up and rapidly dissipate into the atmosphere, and there would be no contamination risk to surrounding soil and groundwater media.

While private water supply wells and springs have been identified near the ACP and SHP area, Atlantic and DETI continue to communicate with landowners to complete surveys for private water supply sources (wells and springs). Therefore, we recommend that Atlantic complete and file the results of the remaining field surveys for wells and springs within 150 feet of the construction workspace, and within 500 feet of the construction workspace in karst terrain. Atlantic and DETI would conduct preconstruction and post-construction (when damage claims are filed with Atlantic/DETI) water quality testing to determine whether construction activities have adversely affected water sources. However, to further ensure wells and springs are not damaged by construction, we recommend Atlantic and DETI test all water supply wells and springs after construction that are within 150 feet of the construction workspace and within 500 feet of the construction workspace in karst terrain. All testing would be conducted by a qualified independent contractor. If damage occurred, Atlantic and DETI have committed to providing a temporary potable water source, and/or a new water treatment system or well.

Concerns were raised regarding the potential for construction activities to intercept subterranean streams or karst conduits and interrupt the water source. We conclude the likelihood of intercepting a saturated karst conduit is very low. Atlantic and DETI would restore the ground surface as closely as practicable to original contours, and re-establish vegetation to facilitate restoration of pre-construction overland water flow and recharge patterns. Atlantic and DETI would further minimize surface water and ground water flow impacts by implementing their construction and restoration plans.

Temporary, minor, and localized impacts could result during trenching activities in areas with shallow groundwater (depth less than 10 feet below the ground surface); however, no long-term impacts on groundwater are anticipated from construction or operation of ACP and SHP because disturbances would be temporary, erosion controls would be implemented, and natural ground contours and vegetation would be restored. Implementation of the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (*Plan*) and *Wetland and Waterbody Construction and Mitigation Procedures (Procedures*), as well as Atlantic's and DETI's *Karst Mitigation Plan, Restoration and Rehabilitation Plan, Blasting Plan, Spill Prevention, Control, and Countermeasures* (*SPCC*) *Plan, Stormwater Pollution Prevention Plans*, *Slope Stability Policy and Procedures*, and *Fugitive Dust Control and Mitigation Plan* would further limit any impacts from construction on groundwater resources. Atlantic and DETI would implement a *Contaminated Media Plan* to address unanticipated discoveries of contaminated media and would complete post-construction water quality tests for water supply wells and springs within 500 feet of encountered contaminants. The greatest threat posed to groundwater resources would be a hazardous material spill or leak into groundwater supplies. Implementing the strategies and methods presented in Atlantic and DETI's *SPCC Plans* would prevent or limit the potential for construction-related spills. We do not anticipate any significant impacts on aquifers by the proposed ACP and SHP given their depth and the relatively shallow nature of construction.

Wetlands and Waterbodies

There are 1,669 waterbody crossings on ACP and SHP (including access roads), including 702 perennial, 642 intermittent, 228 ephemeral, 49 canals/ditches, and 48 open water ponds/reservoirs (some waterbodies are crossed more than once). This also includes 18 major waterbody crossings (those greater than 100 feet wide) and 12 section 10 (navigable) waterbodies. No major waterbodies would be crossed by SHP. ACP would cross 4 perennial, 13 intermittent, and five ephemeral waterbodies on the MNF, and 13 perennial, 15 intermittent, and 6 ephemeral waterbodies on the GWNF. Waterbodies would be crossed in accordance with Atlantic's and DETI's construction and restoration plans, which outline common industry construction methods and are generally consistent with the FERC *Procedures*. Twenty-eight waterbodies, many of which are sensitive or contain threatened and endangered species, would be crossed via HDD or bore, including major waterbodies such as the James, Roanoke, Fishing Creek, Swift Creek, Tar River, Cape Fear, Nottoway, Blackwater River, and Nansemond Rivers. Trenchless installation methods (HDD or bore) place the pipeline below the waterbody and avoid direct impacts on water quality and aquatic life. Atlantic's *HDD Contingency Plan* would be implemented at each HDD crossing to minimize and address potential issues associated with HDD crossings, including an inadvertent loss of drilling mud. We recommend that Atlantic complete hydrofracture assessments for the Neuse River and Nottoway River, and if the risk of hydrofracture is low, Atlantic implement a HDD at these crossings. We also recommend that Atlantic file updated site-specific crossing plans for major waterbody crossings that have changed in location or design, and to include site-specific mitigation and restoration requirements on the plans.

Blasting may be required to install portions of the pipeline and would be done in compliance with federal, state/commonwealth, and local regulations governing the use of explosives and in accordance with Atlantic's and DETI's *Blasting Plan*. Should an inadvertent spill of fuels, lubricants, solvents, and other hazardous materials occur within a waterbody, Atlantic and DETI would implement their *SPCC Plan* to control and mitigate the inadvertent spill.

Atlantic is proposing to use about 141 million gallons of surface waters and municipal water for hydrostatic testing, dust control, and to construct HDDs; and DETI is proposing to use 7.1 million gallons for hydrostatic testing and dust control. Impacts associated with the withdrawal and discharge of water would be minimized by Atlantic's and DETI's adherence to their construction and restoration plans, and state water withdrawal and National Pollutant Discharge Elimination System discharge permits. Atlantic and DETI are still evaluating potential water sources for dust control. Due to the large quantity of water needed, we recommend that Atlantic and DETI identify proposed or potential sources of water used for dust control, anticipated quantities of water to be appropriated from each source, and the measures that would be implemented to ensure water sources and its aquatic biota are not adversely affected by the appropriation activity.

Construction of ACP and SHP would temporarily affect 798 acres of wetland and operation would affect 244 acres of wetland. Most impacts would be on palustrine forested wetlands, affecting 604 acres and 227 acres during construction and operation, respectively. Wetlands affected in all temporary work areas would be allowed to return to preconstruction conditions following construction. A small amount of wetlands (6.9 acres for ACP and 0.5 acre for SHP) would be permanently affected by construction of new aboveground facilities and new or permanently maintained access roads. Of the total wetlands affected, less than 1.0 acre of emergent, forested, and scrub-shrub wetlands would be temporarily and permanently impacted on federal lands.

While temporary impacts on herbaceous and scrub-shrub wetlands would be expected to recover fairly quickly, we recognize that impacts on forested wetlands would be long-term in the temporary work areas and permanent in the maintained pipeline easement, at aboveground facilities, and new or permanently maintained access roads. Atlantic and DETI are working with the USACE to determine wetland mitigation requirements and we recommend that they file copies of their final wetland mitigation plans and documentation of USACE approval of the plans.

Based on the avoidance and minimization measures developed by Atlantic and DETI, and our recommendations, we conclude that surface water and wetland impacts would be effectively minimized or mitigated. Construction and operation-related impacts on wetlands would be further minimized or mitigated by compliance with the conditions imposed by the USACE and state water regulatory agencies.

Vegetation, Wildlife, and Aquatic Resources

Impacts on vegetation from ACP and SHP would range from short-term to permanent due to the varied amount of time required to reestablish certain community types, as well as the maintenance of herbaceous and shrub vegetation within the permanent right-of-way and the conversion of aboveground facility locations and new permanent access roads to non-vegetated areas. The greatest impact on vegetation would be on forested areas because of the time required for trees to return to preconstruction condition. Construction in forest lands would remove the tree canopy over the width of the construction right-of-way, which would change the structure and local setting of the forest area. The re-establishment of young trees in the temporary workspaces would take years, and re-establishment of young reproducing forest would likely take decades. The recovery time for a closed canopy of mature forest, and the habitat values that currently exist within such areas could take up to a century or more. ACP and SHP would also contribute to forest fragmentation. Moreover, the forest land on the permanent right-of-way would be affected by ongoing vegetation maintenance during operations, which would preclude the re-establishment of trees on the rights-of-way. Operation of ACP and SHP would have long-term to permanent effects on about 3,456 acres of vegetation, including about 2,744 acres of upland forest vegetation (deciduous, coniferous, and mixed). Operation of ACP on federal land would have long-term to permanent impacts on about 388 acres of vegetation, including about 103 acres in MNF, 285 acres in

GWNF, and 0.5 acre in BRP. Vegetation types, such as grassland/herbaceous, barren, and emergent wetlands, would return to preconstruction conditions following restoration of ACP and SHP facilities.

To minimize impacts associated with vegetation and forest clearing, Atlantic and DETI would implement the construction and restoration measures identified in the FERC *Plan* and *Procedures*, and their *Restoration and Rehabilitation Plan*, *COM Plan* (for activities on NFS lands), *SPCC Plan*, *HDD Contingency Plan*, *Timber Removal Plan*, *Invasive Plant Species Management Plan*, *Fire Prevention and Suppression Plan*, *Open Burning Plan*, *Fugitive Dust Control and Mitigation Plan*, WVDEP's Erosion and Sediment Control Best Management Practice Manual, the Virginia Erosion and Sediment Control Handbook, the Pennsylvania Erosion and Sediment Pollution Control Handbook, and the North Carolina Erosion and Sediment Control Planning and Design Manual. To further minimize impacts on vegetation, we recommend that Atlantic limit maintenance and vegetation clearing activities along the AP-1 mainline to a 50-foot-wide right-of-way; incorporate mitigation measures and seed mixes for the Seneca State Forest; manage herbicide and pesticide use; and minimize vegetation impacts along an access road in the GWNF.

Construction impacts on wildlife species include the displacement of wildlife from the rights-of-way or work sites into adjacent areas, habitat impacts, and the potential mortality of some individuals. The cutting, clearing, and/or removal of existing vegetation within the construction work area could impact wildlife by reducing the amount of available habitat for nesting, cover, and foraging. Construction could also lower reproductive success by disrupting courting, nesting, or breeding of some species, which could also result in a decrease in prey available for predators of these species. Impacts on forested habitat and the fragmentation of interior forest blocks would have the greatest effect on wildlife habitat. In total, ACP and SHP would result in loss of 4,892 acres of interior forest habitat and create 30,025 acres of new forest edge habitat extending 300 feet from the edges of construction workspace. Implementation of Atlantic's and DETI's construction and restoration plans, in addition to our recommendations made throughout this EIS, would reduce these impacts. However, due to the permanent removal of forest habitat for the operation of ACP and SHP and the time needed for wildlife habitat to recover within the temporary right-of-way, these impacts would be considered long-term to permanent.

ACP could impact cave invertebrates and other subterranean obligate species (amphipods, isopods, copepods, flatworms, millipedes, beetles, etc.) that are endemic to only a few known locations. Atlantic's and DETI's *Karst Mitigation Plan* outlines measures to avoid or minimize potential impacts on karst and subterranean habitats. However, because certain subterranean obligate species are endemic to only a few known locations and are vulnerable to changes in hydrological pattern or water quality, it is possible that ACP-related construction impacts could have population-level effects on these species. Therefore, we recommend that Atlantic complete additional electrical resistivity imagery studies and analysis to identify surficial karst features and connectivity to karst voids and cave systems, and monitor the pipeline right-of-way in karst areas for subsidence following construction. We are also consulting with the FWS to further minimize impacts on ESA-listed subterranean species.

Atlantic and DETI developed a *Migratory Bird Plan* to minimize breeding and nesting impacts. Atlantic and DETI currently plan to avoid tree clearing during the state-specific migratory bird season, and would implement no-activity buffers around active nests for certain species of raptors and rookeries. Atlantic would maintain its permanent right-of-way according to the FERC *Plan* and *Procedures* and state-specific migratory bird time of year restrictions. Atlantic would also construct communication towers according to FWS guidelines to minimize impacts on migratory birds. To minimize impacts on active rookeries, we recommend that Atlantic and DETI develop and implement appropriate conservation measures in coordination with the FWS and the appropriate state agencies.

Atlantic and DETI would minimize aquatic resource impacts by using various trenchless or dry crossing methods, extra workspace restrictions, and restoration procedures. Atlantic would implement mussel relocation in West Virginia, Virginia, and North Carolina; and non-mussel aquatic species relocation plans in Virginia and North Carolina that would involve the relocation of aquatic species to suitable habitat outside the work area prior to in-stream construction activities. Long-term impacts related to slope instability adjacent to waterbodies have the potential to adversely impact water quality and stream channel geometry, and therefore downstream aquatic biota. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted.

Atlantic and DETI would also implement measures outlined in their construction and restoration plans, such as restoring stream beds and banks to preconstruction conditions and implementing measures to minimize erosion and sediment loads. Adherence to the restoration plans would promote regrowth of riparian vegetation. Where in-stream blasting may occur, Atlantic and DETI would implement their *Blasting Plan* that provides measures for minimizing blasting-related fishery impacts. Atlantic and DETI have also committed to adhering to agency-recommended time of year restrictions for most in-stream activities, including water withdrawal to avoid impacts on sensitive aquatic resources, with a few exceptions noted in this EIS. We recommend that Atlantic and DETI address agency recommended mitigation measures that have not been incorporated into the project construction and restoration plans.

By implementing the impact avoidance, minimization, and mitigation measures proposed by Atlantic and DETI in their various construction and restoration plans, including the *COM Plan* for NFS lands; routing the pipeline to minimize impacts on sensitive areas; collocating the pipeline with other rights-of-way where feasible; reducing the construction right-of-way through wetlands; and implementing our recommendations, we conclude that ACP and SHP would not have a significant adverse impact on vegetation, wildlife, and aquatic resources, with the exception of forested areas, which would experience significant impacts as a result of fragmentation and where forest land would convert to herbaceous vegetation in the permanent right-of-way, and subterranean obligate species, which could experience population-level impacts where suitable habitat is altered by construction activities.

Socioeconomic Concerns

Numerous commenters stated ACP and SHP would not benefit their communities. Whereas a specific location may not benefit from direct connection to a particular interstate natural gas transmission pipeline, interstate transmission pipelines are necessary to transport natural gas from source areas to demand centers, and end use customers including electric generation facilities, industrial plants, and local distribution companies. The benefits of such actions are often realized on a regional scale. For example, states that do not produce appreciable natural gas, including Virginia and North Carolina, benefit substantially from the nation's interstate natural gas transmission system. During construction, ACP and SHP would benefit the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables and project-specific materials, and sales tax. Operation of the projects would result in long-term tax benefits for the counties crossed.

We received numerous comments concerning ACP's and SHP's impacts on property values. The effect that a pipeline easement may have on a property value is a damage-related issue that would be negotiated between the landowner and the applicants during the easement acquisition process, which is designed to provide fair compensation to the landowner for the company's right to use the property for pipeline construction and operation. If the Commission issues Certificates of Public Convenience and Necessity for ACP and SHP and easement negotiations are unsuccessful between the respective applicant and property owner, fair compensation for the easement would be determined through legal proceedings and the eminent domain process. Regarding potential future sale of properties that contain natural gas facilities, each potential purchaser has different criteria and differing values or considerations for purchasing land. Decisions made by a purchaser are often site-specific and are difficult to generalize or predict. With some exceptions, such as building structures within the pipeline easement or planting trees, once a pipeline is buried, it does not preclude future use. Based on literature reviews and discussions with real estate appraisers, we conclude that ACP and SHP would not result in decreased property values.

We received comments from several local business owners concerned that construction of ACP and SHP would negatively impact their businesses and may, in some instances force them to close. We acknowledge that businesses may be directly and indirectly impacted by the projects; however, overall construction of ACP and SHP would benefit state and local economies by creating a short-term stimulus to the affected areas. The long-term socioeconomic effect of the projects during operation is also likely to be beneficial, based on the increase in tax revenues that would accrue in the affected communities and jurisdictions.

We received comments regarding the potential for negative effects on natural resources and the environment from construction and operation of ACP and SHP to negatively affect tourism, particularly in the Rockfish Valley and Wintergreen areas in Nelson County, Virginia, Yogaville in Buckingham County, Virginia, and Pocahontas County, West Virginia. Travelers and tourists in each state crossed by the projects would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with construction workspaces. Atlantic would coordinate with Rockfish Valley and Wintergreen area businesses and recreational stewards to inform them of construction schedules and traffic volumes and would, to the extent practicable, schedule construction activities to avoid conflicts with special events. Yogaville is located 1 mile from the ACP route and over 4 miles from a proposed compressor station; therefore, we conclude no direct or indirect impacts on tourism to Yogaville would result from construction and operation of the project.

We received comments regarding traffic impacts on existing narrow, single-lane, unpaved roads that have been identified by Atlantic as access roads for use during construction in areas of West Virginia and Virginia. We acknowledge there may be temporary construction impacts on residences and businesses along these more narrow, rural access roads. Impacts may include inconveniences caused by noise and dust; disruption to access of home and businesses; and traffic congestion. Atlantic and DETI would prepare spread-specific traffic and transportation management plans for managing vehicle traffic during construction of the projects to mitigate and minimize impacts.

We also received comments that ACP would delay or potentially prevent two large projects from being developed in the Rockfish Valley area: a luxury hotel at Wintergreen Resort and the Spruce Creek Resort and Market, a proposed resort, hotel, restaurant, and public market. Based on information provided by Wintergreen Property Owners Association Inc. and Wintergreen Resort Inc., the proposed hotel would be located over 1 mile east of the project. According to developers, the proposed development is estimated to produce $15 million to $20 million in annual revenue. Based on information provided by the developer, the AP-1 mainline would cross the Spruce Creek Resort and Market in Nelson County, Virginia. Specifically, the developer is concerned that the project would cross the middle of the property, eliminating the attractiveness of the resort area and, thus, development of the resort would be stopped. We conclude that construction of ACP and development of the hotel at Wintergreen Resort and the development of Spring Creek Resort and Market could be accomplished such that impacts associated with ACP are reduced or mitigated for, while maintaining the appeal of the area, as demonstrated by other residential and commercial developments in the area and similar projects throughout the country.

We received comments expressing concern about African American populations near ACP and SHP that could experience disproportionate impacts from construction dust and compressor station emissions due to their susceptibility to asthma. Impacts from construction dust would be minor as they would be temporary, localized, and not substantially alter the resource. Impacts from compressor station emissions would be moderate because, while they would be permanent facilities, air emissions would not exceed regulatory permittable levels. As a result, no disproportionately high and adverse impacts on environmental justice populations as a result of air quality impacts, including impacts associated with the proposed Compressor Station 2, would be expected as a result of ACP and SHP. Also, no disproportionately high and adverse impacts on environmental justice populations as a result of other resources impacts would be expected.

Based on the analysis presented, we conclude that ACP and SHP would not have a significant adverse impact on the socioeconomic conditions of the project areas.

Pipeline Integrity and Public Safety

We received numerous comments expressing concern about the integrity of ACP and SHP facilities and their impact on public safety. All the proposed facilities would be designed, constructed, operated, and maintained to meet or exceed the PHMSA's Minimum Federal Safety Standards in 49 CFR 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualifications; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion. In addition to meeting all federal design standards, Atlantic and DETI would also regularly monitor their facilities and perform routine inspections to ensure facility integrity. These efforts would assist in the early detection of anomalies and would reduce the likelihood of a pipeline incident. Additionally, based on an extensive review of publicly available information, we have found no evidence that karst hazards such as sinkhole development pose a safety or integrity risk to interstate transmission pipeline facilities. For these reasons, we conclude that ACP and SHP would not significantly affect public safety.

Cumulative Impacts

A cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. NEPA requires that the Commission conduct a cumulative impacts analysis. Consistent with available guidance and to determine cumulative impacts, we identified projects whose impacts, when combined with those of ACP and SHP, could result in a cumulative impact on the environment. ACP and SHP would occur in a region that has historically been affected by human activity (e.g., timber harvesting, agricultural practices, community and industrial development, and the introduction of non-indigenous plants, animals, and insects). If constructed, the impacts of ACP and SHP and those of the identified past, present, and reasonably foreseeable projects or actions would result in varying degrees of cumulative impact on the environment.

Long-term but minor cumulative impacts would occur on forested wetland and upland forested vegetation and associated wildlife habitats, as well as waterbodies, special status species, and visual quality. Impacts on vernal pools, rocky outcrops, and subterranean features could adversely affect habitat of wildlife species with limited mobility and home ranges. Subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality; therefore, it is possible that impacts associated with construction activities could have population-level effects on these species. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials. There is also the potential that the proposed projects would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the proposed projects displaces the use of other more polluting fossil fuels. However, based on the implementation of impact avoidance, minimization, and mitigation measures, we have concluded that most of impacts from construction and operation of ACP and SHP, when added to the impacts of other projects, would not result in a significant cumulative impact on the environment.

ALTERNATIVES EVALUATED

We evaluated the no-action alternative, system alternatives, route alternatives and variations, and aboveground facility site alternatives. While the no-action alternative would eliminate the short- and long-term environmental impacts identified in this EIS, the end-use markets would not receive the natural gas to the delivery points specified by the precedent agreements signed by Atlantic and DETI within a timeframe reasonably similar to the proposed projects. Because this alternative would not be able to meet the purpose of ACP and SHP, we conclude it is not preferable to the proposed action. We also conclude alternative energy sources, energy conservation, and efficiency are not within the scope of this analysis because the purpose of ACP and SHP is to transport natural gas.

Our analysis of system alternatives concluded that other existing natural gas transmission systems in the ACP and SHP area lack the available capacity to meet the purpose of the projects (except for Atlantic's proposed lease of capacity on the Piedmont system). Modifying these systems could result in impacts similar to those of the proposed projects or would be economically impractical. Additional compression/looping would not offer a significant environmental advantage over the proposed actions. The use of an alternative transportation system, liquefied natural gas sourced gas, and/or truck or rail would be economically impractical. We conclude that the use of a system alternative is not preferable to the proposed action.

We evaluated 27 major pipeline route alternatives, including routes that would follow the proposed Mountain Valley Pipeline right-of-way, existing electric transmission rights-of-way, and interstate/highway rights-of-way, and several variations to avoid or minimize crossing of NFS and National Park Service lands. We also evaluated four route variations and reviewed over 201 variations considered by Atlantic and DETI. Furthermore, we evaluated several alternatives for Atlantic's proposed Compressor Stations 1, 2, and 3. We also evaluated the feasibility of using electric motor-driven compressors as an alternative to the natural gas-driven compressors proposed for ACP. Increasing collocation with existing rights-of-way, avoiding federal lands, concern about construction through karst sensitive terrain, impacts on affected landowners and communities, and general environmental concerns were all reasons for evaluating pipeline alternatives and variations. In evaluating these alternatives and variations, we compared several factors including (but not limited to) total length, acres affected, wetlands and waterbodies crossed, forested land crossed, the number of residences within 50 feet of workspace, public land crossed, recreation features crossed, and collocation with existing rights-of-way. We also considered construction constraints and economic practicality.

To address concerns raised by the FS, Atlantic developed and adopted a 90-mile route change to avoid sensitive salamander habitats (associated with Atlantic's March 14, 2016 amendment). Additionally, in response to consultation with Commission staff in pre-filing, Atlantic adopted several route alternatives when it filed its application that collocated with existing utility or road rights-of-way. Because of these consultations, Atlantic adopted nearly 60 miles of additional collocation into its route.

Based on our evaluations, we conclude that the major pipeline route alternatives do not offer a significant environmental advantage when compared to the proposed route or would not be economically practical; and therefore, are not preferable to the proposed action. We recommend that DETI continue to consult with the Westmoreland Conservancy to minimize impacts to conservation lands, and recommend that Atlantic incorporate the Butterwood Creek Route Variation into the final ACP route. Lastly, we conclude that the alternative aboveground facility locations evaluated do not offer significant environmental advantages when compared to the proposed locations and are not preferable to the proposed action.

MAJOR CONCLUSIONS

As described in this executive summary and throughout the environmental analysis section of this EIS, we conclude that construction and operation of ACP and SHP would result in temporary and permanent impacts on the environment. We also conclude that the projects would result in some adverse effects, but with Atlantic's and DETI's implementation of their respective impact avoidance, minimization, and mitigation measures as well as their adherence to our recommendations to further avoid, minimize, and mitigate these impacts, most project effects would be reduced to less-than-significant levels. Although many factors were considered during our environmental review, the principal reasons for these conclusions are:

- Atlantic and DETI would minimize impacts on the natural and human environments during construction and operation of its facilities by implementing the numerous measures described in their respective construction and restoration plans;
- all the proposed facilities would be constructed and operated in compliance with federal standards, requirements, and thresholds including DOT materials requirements and EPA air emissions standards;
- Atlantic would complete a *COM Plan* that includes additional measures to minimize impacts on environmental resources on NFS lands, and the FS' SUP process for Atlantic's easement over federal lands would provide terms and conditions for construction and operation;
- a high level of public participation was achieved during the pre-filing and post application review processes and helped inform our analysis;
- environmental justice populations would not be disproportionately affected by the projects;
- Atlantic and DETI would implement a steep slope management program and slip avoidance, identification, prevention, and remediation plan to minimize erosion and landslide potential in steep slope areas;
- the HDD crossing method would be utilized for most major waterbodies, most other waterbodies would be crossed using dry crossing methods, and Atlantic and DETI would be required to obtain applicable permits and provide mitigation for unavoidable impacts on waterbodies and wetlands through coordination with the USACE and state regulatory agencies;
- we would complete the process of complying with the ESA prior to any construction, and the FWS would issue biological opinions that include additional conservation measures, as needed, to assure that ACP and SHP would not jeopardize the continued existence of any species under their jurisdiction and would not adversely modify or destroy designated critical habitat;
- we would complete the process of complying with section 106 of the National Historic Preservation Act and implementing the regulations at 36 CFR 800 prior to allowing any construction to begin; and

- environmental inspection and monitoring programs would ensure compliance with all construction and mitigation measures that become conditions of the FERC authorizations and other approvals.

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC or Commission) is responsible for deciding whether to authorize the construction, operation, and maintenance of interstate natural gas transmission pipeline facilities. As part of its decision-making process, the Commission is required by the National Environmental Policy Act (NEPA) and its implementing regulations to consider the environmental impacts resulting from the construction and operation of a proposed project. The Commission's environmental staff has prepared this final Environmental Impact Statement (EIS) to assess the potential environmental impacts that could result from the construction and operation of two separate, but related, interstate natural gas transmission pipelines and associated facilities proposed by Atlantic Coast Pipeline, LLC (Atlantic) and Dominion Energy Transmission, Inc. (DETI).[1] Atlantic would construct and operate the Atlantic Coast Pipeline (ACP) and DETI would construct and operate the Supply Header Project (SHP). The U.S. Department of Agriculture (USDA) – Forest Service (FS); U.S. Army Corps of Engineers (USACE); U.S. Environmental Protection Agency (EPA); U.S. Fish and Wildlife Service (FWS), West Virginia, Virginia, North Carolina Field Offices; FWS, Great Dismal Swamp National Wildlife Refuge (NWR); West Virginia Department of Environmental Protection (WVDEP); and West Virginia Division of Natural Resources (WVDNR) are cooperating agencies assisting in the preparation of the EIS because they have jurisdiction by law or special expertise with respect to environmental resources and impacts associated with Atlantic's and DETI's proposal. The roles of the FERC and the cooperating agencies in the review process for both projects are described in section 1.2.

The vertical line in the margin identifies text that is new or modified in the final EIS and differs materially from corresponding text in the draft EIS. Changes were made to address comments from cooperating agencies and other stakeholders on the draft EIS; incorporate modifications to ACP and SHP proposed by Atlantic and DETI after publication of the draft EIS; and incorporate information filed by Atlantic and DETI in response to our recommendations in the draft EIS. As a result of the changes, 50 of the recommendations identified in the draft EIS are no longer applicable to ACP and SHP and do not appear in the final EIS. Additionally, 15 recommendations identified in the draft EIS have been substantively modified in the final EIS, and 36 new recommendations have been added in the final EIS.

On September 18, 2015, Atlantic and DETI filed respective applications with the FERC in Docket Nos. CP15-554-000 and CP15-555-000 pursuant to sections 7(b) and 7(c) of the Natural Gas Act (NGA) and Parts 157 and 284 of the Commission's regulations. Atlantic and DETI are seeking Certificates of Public Convenience and Necessity (Certificate) to construct, own, and operate a natural gas pipeline and related facilities, and Blanket Certificates for limited future activities and services on the new facilities. In addition, on September 18, 2015, Atlantic and Piedmont Natural Gas. Co., Inc. (Piedmont) filed a joint application with the FERC in Docket No. CP15-556-000 pursuant to section 7(c) of the NGA and Part 157 of the Commission's regulations. Atlantic and Piedmont are seeking Certificates that would authorize Atlantic to lease capacity on Piedmont's existing pipeline distribution system for use by Atlantic for the Public Service Company of North Carolina, Inc. (Capacity Lease). In addition, Piedmont requests a limited jurisdiction Certificate to enter into the Capacity Lease with Atlantic to allow for the interstate transportation of natural gas through Piedmont's facilities. Piedmont is requesting a determination that the Capacity Lease would not affect its status as a natural gas local distribution company, which would not otherwise be subject to regulation by the Commission.

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1 Atlantic is a company formed by Dominion Energy, Inc. (Dominion); Duke Energy Corporation; Piedmont Natural Gas Co., Inc.; and The Southern Company. DETI is a subsidiary of Dominion.

On March 14, 2016, Atlantic filed an amendment to its initial application with the FERC in Docket No. CP15-554-001. Atlantic's amended application identified various route modifications to its initially proposed route in West Virginia, Virginia, and North Carolina.

ACP would involve constructing and operating 519.7 miles of 42- and 36-inch-diameter mainline pipeline; 84.8 miles of 16- and 20-inch-diameter lateral pipeline; three new compressor stations; and valves,[2] pig[3] launchers and receivers, and meter and regulating (M&R) stations[4] in West Virginia, Virginia, and North Carolina. Atlantic would seek approval to begin construction as soon as possible after receiving all necessary permits and authorizations; Atlantic's proposed construction schedule is described in section 2.4. ACP would be capable of delivering up to 1.5 billion cubic feet per day (Bcf/d) of natural gas.

SHP would involve constructing and operating 37.5 miles of 30-inch-diameter pipeline loop,[5] modifications at four existing compressor stations, one M&R station, and valves and pig launchers and receivers in Pennsylvania and West Virginia. DETI would seek approval to begin construction as soon as possible after receiving all necessary permits and authorizations; DETI's proposed construction schedule is described in section 2.4. SHP would enable DETI to provide firm transportation service of up to 1.5 Bcf/d of natural gas to various customers, including Atlantic. In addition, DETI is requesting authorization to abandon in place two existing gathering compressor units at its existing Hastings Compressor Station in Wetzel County, West Virginia.

A detailed description of the projects is presented in section 2. Figure 1-1 provides an overview map of ACP and SHP.

1.1 PROJECT PURPOSE AND NEED

Atlantic's and DETI's stated purpose for ACP and SHP are, in summary:

- to serve the growing energy needs of multiple public utilities and local distribution companies in Virginia and North Carolina by using the natural gas to generate electricity for industrial, commercial, and residential uses;
- to provide natural gas for direct residential, commercial, and industrial uses;
- to increase the reliability and security of natural gas supplies in Virginia and North Carolina; and
- to provide access to a low cost supply hub[6] with a large volume of transactions characterized by multiple buyers and sellers willing to trade natural gas on a daily basis and into the futures market (liquidity).

Additional discussion of each project component is provided below.

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[2] A valve is an aboveground facility that is capable of controlling the flow of gas in a pipeline.

[3] A pipeline pig is a device used to clean or inspect a pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

[4] A meter and regulating station is an aboveground facility that contains the equipment necessary to measure the volume of gas flowing in a pipeline.

[5] A pipeline loop is a segment of pipe constructed along an existing pipeline to increase capacity.

[6] A hub is a location where two or more pipeline systems interconnect and that offers administrative services that facilitate the movement and/or transfer of gas.

1.1.1 Atlantic Coast Project

As stated by Atlantic, ACP would serve the growing energy needs of multiple public utilities and local distribution companies in Virginia and North Carolina. The majority (Atlantic anticipates approximately 79.2 percent) of the natural gas transported by ACP would be used as a fuel to generate electricity for industrial, commercial, and residential uses. Lesser amounts of the natural gas would also be used directly for residential (9.1 percent), industrial (8.9 percent), and commercial and other uses (e.g., vehicle fuel) (2.8 percent). Atlantic states that access to additional low-cost natural gas supplies from ACP would increase the reliability and security of natural gas supplies in Virginia and North Carolina.

Currently, there is only one major interstate pipeline system that serves as the single source of natural gas supplies to most customers in North Carolina: the Transcontinental Gas Pipe Line Company, LLC (Transco) pipeline system (U.S. Energy Information Administration [EIA], 2015). This pipeline system traverses north-south and primarily serves customers in the western part of North Carolina. There are currently no interstate natural gas transmission pipelines that supply eastern North Carolina.

In April 2014, Duke Energy Corporation (Duke Energy) and Piedmont issued requests for proposals (RFPs) for incremental pipeline transportation service due to their existing and future natural gas generation requirements, core load growth, and system reliability and supply diversity goals. In June 2014, Virginia Power Services Energy Corp., Inc. issued an RFP for firm transportation service to serve Virginia. Following the RFP processes, these companies contracted for transportation service on ACP, as did other companies in the region.

According to Atlantic, ACP and SHP would connect growing demand areas in Virginia and North Carolina with growing supply areas in the Appalachian region and provide access to the Dominion South Point supply hub, consisting of abundant supplies on the DETI system that are sourced from a wide variety of upstream pipeline interconnects and diverse production areas. More specifically, ACP would provide up to 1.5 Bcf/d of firm natural gas transportation service into West Virginia, Virginia, and North Carolina.

Of the new firm transportation capacity of up to 1.5 Bcf/d proposed, approximately 1.44 Bcf/d is currently subscribed pursuant to precedent agreements with six customers (Virginia Power Services, Inc.; Duke Energy Progress, Inc.; Duke Energy Carolinas, LLC; Piedmont; Public Service Company of North Carolina, Inc. [PSCN]; and Virginia Natural Gas, Inc.). These customers are major utilities and local distribution companies in the region. Atlantic states that the remaining unsubscribed capacity would be awarded and contracted for in accordance with Commission policies applicable to open-access interstate pipelines and the provisions of applicable FERC gas tariffs.

We[7] received comments disputing the need for gas in the delivery area, and stating that other proposed projects would be capable of delivering gas to the same general area. As discussed above, Atlantic and DETI have entered into long-term precedent agreements for 96 percent of the project capacity to six specific customers. Other proposed projects in the area, such as the Mountain Valley Pipeline (MVP) Project proposed by Mountain Valley Pipeline, LLC, have also entered into precedent agreements for gas, and its customers (EQT Energy, LLC; Roanoke Gas Company; USG Properties Marcellus Holdings, LLC; WGL Midstream, Inc.; and Consolidated Edison Company of New York, Inc.) are different than Atlantic's customers. Additionally, the EIA projects natural gas consumption will continue increasing due to population growth, industrial consumption, and electric power generation (EIA, 2015).

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[7] The pronouns "we," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

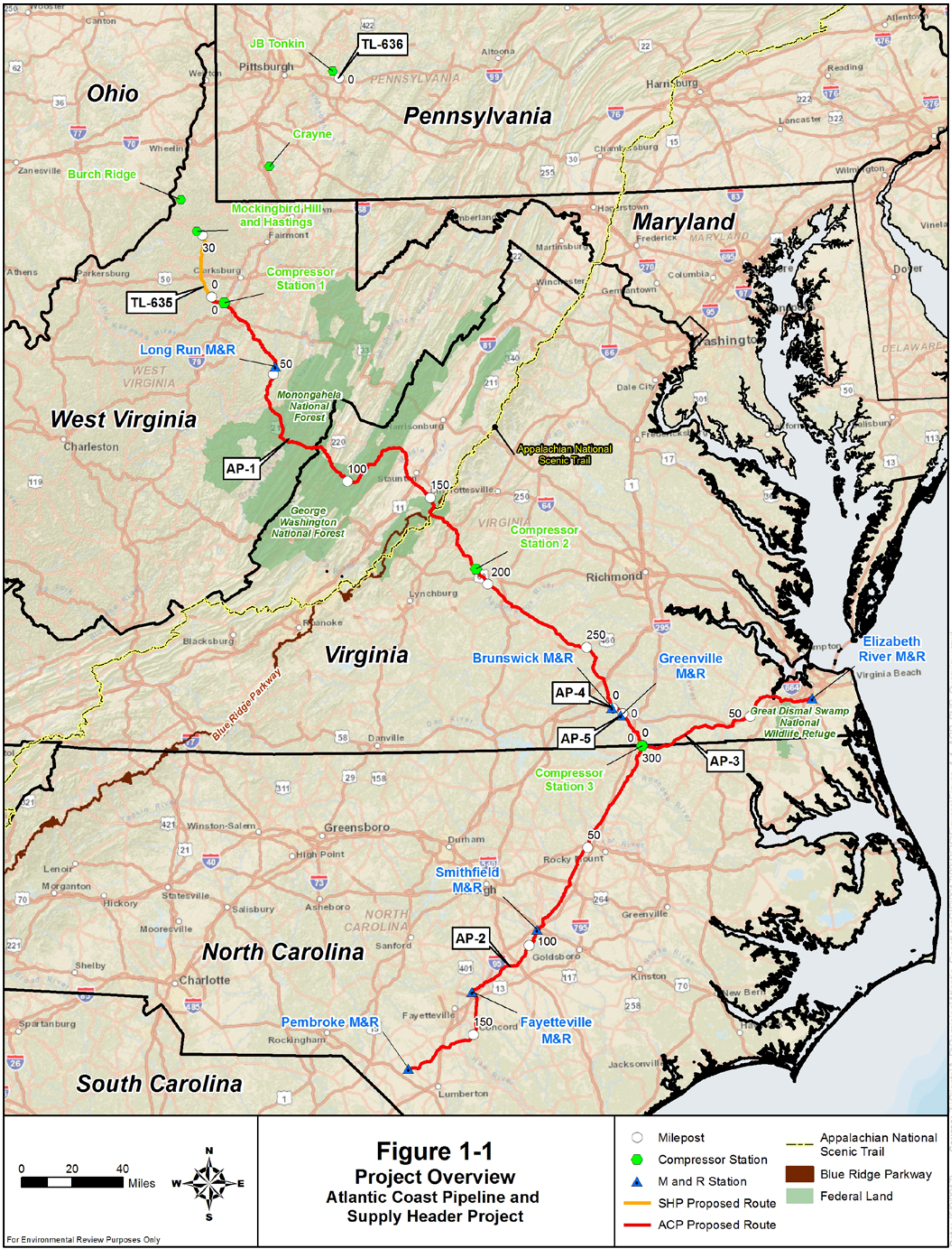

Figure 1-1
Project Overview
Atlantic Coast Pipeline and Supply Header Project

We received comments asserting that the ultimate purpose of ACP and SHP is to export natural gas overseas as liquefied natural gas (LNG). Whereas various proposals to site LNG liquefaction and export facilities are before the Commission and the U.S. Department of Energy (DOE), ACP is not designed to export natural gas overseas; this is not a component of the purpose and need of ACP. In addition, as discussed above, Atlantic's application stated most of the natural gas transported by ACP would be used as a fuel to generate electricity for industrial, commercial, and residential uses. Moreover, there are no licensed or proposed terminals to export liquefied natural gas in either Virginia or North Carolina.

1.1.2 Supply Header Project

SHP would provide Atlantic's customers with access to the Dominion South Point supply hub in Pennsylvania and multiple physical interconnecting entities including upstream natural gas pipelines. According to Atlantic and DETI, this would allow Atlantic's end-use customers to access a variety of supply options providing them access to physical interconnects with upstream suppliers in addition to the market participants who have access to Dominion South Point. In total, SHP would enable DETI to deliver up to 1.5 Bcf/d of natural gas to SHP shippers, including Atlantic, who has committed to approximately 1.44 Bcf/d of the planned capacity of SHP. Atlantic and DETI state that the remaining unsubscribed capacity on SHP would be awarded and contracted for in accordance with Commission policies applicable to open-access interstate pipelines and the provisions of applicable FERC gas tariffs.

1.1.3 Atlantic-Piedmont Capacity Lease

According to Atlantic and Piedmont, the Capacity Lease would allow Atlantic to service North Carolina markets using additional Piedmont capacity that would be available when ACP begins service. Use of this capacity to serve the PSCN (or other customers seeking deliveries in the area) would avoid the need for construction of duplicative facilities, eliminating potential over-building and the consequent effects on landowners and the environment. Moreover, the costs of the Capacity Lease are less than the costs of constructing new pipeline capacity. By integrating the leased capacity with Atlantic's other assets and facilities proposed as part of ACP, and given the access to flexible supplies provided by the related SHP, Atlantic would be able to provide the firm service requested by PSCN in the most environmentally and economically efficient manner. Further, the Capacity Lease would offer significant administrative efficiencies by allowing for nominations and scheduling of supplies with only one pipeline (as opposed to separate nominations to bring supplies through ACP for delivery to the Piedmont gate station, with a separate arrangement with Piedmont to transport through Piedmont's system to a PSCN interconnection). Because the Capacity Lease does not involve the construction of additional facilities, it is not further addressed in this EIS.

1.2 PURPOSE AND SCOPE OF THIS EIS

Our principal purposes in preparing this EIS are to:

1. identify and assess potential impacts on the natural and human environment that would result from constructing and operating ACP and SHP;
2. describe and evaluate reasonable alternatives to ACP and SHP that would avoid or minimize adverse impacts on the environment;
3. identify and recommend specific mitigation measures, as necessary, to avoid or further reduce/minimize environmental impacts; and

4. encourage and facilitate involvement by the public and interested agencies in the environmental review process.

The environmental topics addressed in this EIS include geology; soils; groundwater and surface water; wetlands; vegetation; fish and wildlife; threatened, endangered, and other special-status species; land use and recreation; visual resources; socioeconomics (including environmental justice); cultural resources; air quality and noise; reliability and safety; and cumulative impacts. This EIS describes the affected environment as it currently exists, addresses the environmental consequences of ACP and SHP, and compares the projects' potential impacts to those of various alternatives. The EIS also presents our conclusions and recommended mitigation measures.[8]

1.2.1 Federal Energy Regulatory Commission

The Energy Policy Act of 2005 (EPAct) established FERC as the lead federal agency responsible for evaluating applications to construct, operate, and maintain interstate natural gas pipeline facilities. Certificates are issued under section 7(c) of the NGA if the Commission determines a project is required by the public convenience and necessity. Authorizations are issued under section 7(b) of the NGA if the Commission determines an abandonment will not negatively affect the present or future public convenience and necessity.

As the lead federal agency, we prepared this EIS to assess the environmental impacts that could result from constructing and operating ACP and SHP. This document was prepared in compliance with the requirements of NEPA, the Council on Environmental Quality's (CEQ) regulations implementing procedural provisions of NEPA in Title 40 Code of Federal Regulations Parts 1500-1508 (40 CFR 1500-1508), and the FERC's regulations implementing NEPA in 18 CFR 380. As applicable, this EIS is also intended to fulfill the cooperating federal agencies' NEPA obligations (see section 1.2.2). In addition, this EIS is intended to assist the cooperating state agencies' permitting obligations (see sections 1.2.6 and 1.2.7).

The Commission will consider the findings contained herein as well as non-environmental issues in its review of Atlantic's and DETI's applications. Approvals will be granted only if the FERC finds that the evidence produced on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues demonstrates that ACP and SHP are required by the public convenience and necessity. Environmental impact analyses and mitigation development are important factors in the overall public interest determination.

The FERC may impose conditions on any Certificate granted (if it chooses to do so) for ACP and SHP. These conditions could include requirements and mitigation measures identified in this EIS to minimize environmental impacts associated with ACP and SHP (see section 5.2). We will recommend to the Commission that these requirements and mitigation measures (indicated with bold type in the text) be included as conditions to any approving Certificate issued for ACP and SHP. Further, Atlantic and DETI would be required to implement the construction procedures and mitigation measures it has proposed in its filings with the FERC, including those in appendices of this EIS, unless specifically modified by other Certificate conditions.

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[8] The "recommendations" in the EIS text are not recommendations to the Atlantic and DETI (i.e., they are not mere suggestions to the project sponsors). Rather, they are FERC staff's recommendations to the Commission for inclusion as mandatory conditions to any authorization it may issue for ACP and SHP. Please see section 5.2 of the EIS for how these conditions would appear in a FERC Order.

Other regulatory agencies also may include terms and conditions or stipulations as part of their permits or approvals. While there would be jurisdictional differences between the FERC's and other agencies' conditions, Atlantic's and DETI's environmental inspection program for ACP and SHP would address all environmental or construction-related conditions or other permit requirements placed on ACP and SHP by all regulatory agencies.

1.2.2 Cooperating Agencies

1.2.2.1 U.S. Department of Agriculture – Forest Service

The FS is a civilian federal agency within the USDA, and can trace its roots back to 1876 when Congress assigned the Office of Special Agent within the USDA the responsibility of assessing the quality of forests in the country. With the Forest Reserve Act of 1891, Congress established the process for designating western public domain lands that later became National Forests. In 1905, President Theodore Roosevelt established the FS to provide quality water and timber for the nation's benefit, and transferred the care of the national forests to the new agency. The Weeks Act of 1911 authorized the FS to purchase privately owned lands in the eastern United States for the protection of water supplies and navigable rivers.

The mission of the FS is to sustain the health, diversity, and productivity of the national forests and grasslands to meet the needs of present and future generations. It is the responsibility of the FS to manage the national forests for multiple uses of resources such as water, forage, wildlife, wood, recreation, minerals, and wilderness; and to provide products and benefits to benefit the American people while ensuring the productivity of the land and protecting the quality of the environment. The agency carries out this mission through four main activities: international assistance in forest management, domestic community assistance to help protect and manage non-federal forest lands, forestry research, and the protection and management of National Forest System (NFS) lands. Although the agency manages NFS lands under many laws and regulations, three Acts primarily govern the mission of the FS: the Multiple Use Sustained Yield Act of 1960, NEPA, and the National Forest Management Act of 1976 (NFMA).

Executive Order (EO) 13212, May 18, 2001, directed federal agencies to take appropriate actions, consistent with applicable law, to expedite reviews of authorizations for energy related projects and to take other action necessary to accelerate the completion of such projects while maintaining safety, public health, and environmental protections. To facilitate EO 13212, the Secretaries of Agriculture, Interior, and Energy, and other federal agencies have agreed, through a formal Memorandum of Understanding (MOU), to coordinate their efforts and cooperate in the expeditious processing of authorizations for construction of natural gas pipelines.

In an April 22, 2015 letter to the FERC, the FS agreed to be a cooperating agency in the preparation of this EIS. The FS participated in the NEPA scoping process, prepared environmental analyses related to FS permitting and resource expertise, and contributed to the development of applicable portions of the EIS. The FS will consider adopting this EIS for agency decisions pursuant to 40 CFR 1506.3(c) if, after an independent review of the document, the FS concurs that the analysis provides sufficient evidence to support agency decisions and is satisfied that agency comments and suggestions have been addressed. FS land management planning requirements are established by the NFMA and regulations at 36 CFR 219. These laws and regulations require a national forest-specific, multi-year Land and Resource Management Plan (LRMP). All projects or activities within a national forest must be consistent with the governing LRMP, pursuant to 36 CFR 219.15, and must undergo a NEPA review.

ACP would cross NFS lands of the Monongahela National Forest (MNF) and the George Washington National Forest (GWNF). Pursuant to the Mineral Leasing Act of 1920 and in accordance with federal regulations in 43 CFR 2880, Atlantic must secure a special use permit (SUP) from the FS to cross NFS lands. On November 12, 2015, Atlantic applied to the FS for a SUP to construct and operate its pipeline on the MNF and GWNF, and on June 16, 2016, April 17, 2017, and April 21, 2017, Atlantic submitted revised SUP applications to the FS. The FS is considering issuance of a SUP that would provide terms and conditions for construction and operation of ACP on NFS lands in response to Atlantic's application. Issuance of the SUP must be in accordance with 36 CFR 251 Subpart B, the Mineral Leasing Act of 1920 (as amended), relevant FS manual and handbook direction, the Forest's LRMPs, and other applicable laws and regulations. In making this decision, the FS will consider several factors including conformance with the MNF LRMP (FS, 2011) and GWNF LRMP (FS, 2014) and impacts on resources and programs. Following adoption of the final EIS, the FS will issue a Record of Decision (ROD) that documents the decision whether to issue the SUP to Atlantic.

The issuance of a SUP by the FS would be in addition to any authorization issued by the FERC for ACP. The pipeline right-of-way, if approved, would be authorized by issuance of a temporary SUP from the FS for the pipeline clearing and construction phase, which would terminate upon completion of construction. A long-term SUP for ongoing pipeline operations and maintenance for up to a 30-year term would then be issued. Once ACP is constructed and in operation, the SUP would be modified to reflect the final location of the project, the associated 50-foot-wide maintenance corridor, and any roads on federal lands or under federal easements that are necessary for project operations. A Road Use permit may be required for commercial hauling on existing roads open to the public and under the FS jurisdiction, often known as NFS roads. Such additional permitting would be issued on an individual basis per road if required due to size, weight, or legal travel restrictions.

In accordance with Forest Service Manual 2700, Special Uses Management (FSM 2700), FS policy in FSM 2703.2(2) directs the agency to consider the public interest and authorize use of NFS lands only if: a) the proposed use is consistent with the mission of the FS to manage NFS lands and resources in a manner that will best meet the present and future needs of the American people, taking into account the needs of future generations for renewable and nonrenewable resources; and b) the proposed use cannot reasonably be accommodated on non-NFS lands. FSM 2703.2(3) also states to not authorize the use of NFS lands solely because it affords the applicant a lower cost or less restrictive location when compared with non-NFS lands.

The FS will use this EIS to review the project in accordance with applicable regulations, including, but not limited to, FSM 1900 – Planning, Chapter 1920 – Land Management Planning; FSM 2700 – Special Uses Management, Chapter 2720 – Special Uses Administration (2726.31b through 2726.31e, 2726.32, 2726.33, 2726.34, etc.); 36 CFR 251.54; 36 CFR 219.15; and 30 United States Code (U.S.C.) 185.

Monongahela National Forest and George Washington National Forest

Approximately 5 miles of the AP-1 mainline right-of-way would cross the MNF in Pocahontas County, West Virginia; and 16 miles of the AP-1 mainline right-of-way would cross the GWNF in Highland, Bath, and Augusta Counties, Virginia. There are no significant aboveground facilities (such as compressor stations, M&R stations, valves) proposed within the MNF or GWNF, although there would be minor appurtenances that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by the U.S. Department of Transportation (DOT) – Pipeline and Hazardous Materials Safety Administration (PHMSA) safety regulations. A summary of land requirements on NFS lands is provided in section 2.2. Specific milepost ranges crossed by the AP-1 mainline are provided in section 4.8.9.

During the early planning stages of the project, Atlantic worked to identify a route(s) that avoided NFS lands. However, the linear nature of the pipeline corridor and the boundaries of the MNF and GWNF make it difficult to avoid NFS lands while still meeting the project objective with respect to contracted delivery points. Section 3.3.4 provides our analysis of a potential route alternative that would avoid NFS lands, as well as an alternative route crossing NFS lands.

The topography within the MNF and GWNF also makes it difficult to avoid every circumstance that would be inconsistent with the management direction and standards in the LRMPs. If the FS decides to issue a SUP for crossing the MNF and GWNF, the FS has determined that it would be required to amend the respective LRMPs. The FS intends to also adopt this EIS in its assessment of potential amendments to the LRMPs that could then make ACP a conforming use of the LRMPs (additional detail is in section 4.8.9 of this EIS). One ROD will be issued that will include the decisions for the LRMP amendments and the authorization for the pipeline crossing for both the MNF and GWNF.

One of the many partnerships that the FS participates in for the management of certain NFS lands is the unique cooperative management system partnership for the Appalachian National Scenic Trail (ANST). The ANST, first envisioned in 1921 and first completed as a footpath through 14 states in 1937, became the first National Scenic Trail in the United States with the passage of the National Trails System Act (NTSA) in 1968. This federal law designates the entire 2,190-mile-long ANST as a National Scenic Trail; designates the National Park Service (NPS) as the lead federal agency for the administration of the entire ANST; recognizes the rights of the other federal and state public land managers whose lands are crossed by the ANST; and requires the consistent cooperative management of the unique ANST resource by the NPS; working formally with the non-profit Appalachian Trail Conservancy (ATC), local ATC-affiliated Trail Clubs, and all the public land managing agencies that the ANST traverses – notably and specifically, the FS. More of the ANST is on NFS lands than any of more than 75 other public land ownerships trail-wide.

Both the NPS and FS have acquired private lands in the name of the U.S. Government specifically for the protection of the ANST, beyond the public lands that they already managed in 1968. Near the proposed ACP route, because of the location of the official proclamation boundary of the GWNF, the NPS and FS have each separately acquired several land parcels since 1978 for the ANST. Under the authority of the NTSA, ongoing management of some of the NPS-acquired parcels has been administratively transferred to the FS through a Memorandum of Agreement (MOA). In the MOA, the NPS retained certain responsibilities over the transferred trail segments, including any future authorization of oil or gas pipeline crossings. The NPS retains only those specific interests in the lands which were expressly reserved in the MOA. Otherwise, the trail segments transferred to the FS are subject exclusively to FS regulations and management authority under the terms of the MOA and are in all respects NFS lands for the duration of the MOA. The ANST is a unit of the National Park system; however, the lands acquired and administered by the FS for the ANST are NFS lands and subject exclusively to FS regulations and management authority. The currently proposed ACP route does not involve NPS-transferred trail segments; thus, an authorization from the NPS is not required for Atlantic's proposed ANST crossing on NFS lands. This difference between NPS and FS administrative actions on their respective managed lands is a factor in the proposed routing of ACP across FS-acquired ANST parcels rather than NPS-acquired ANST parcels.

1.2.2.2 U.S. Army Corps of Engineers

ACP and SHP cross areas within the Huntington, Pittsburgh, Norfolk, and Wilmington Districts of the USACE. The USACE has jurisdictional authority pursuant to section 404 of the Clean Water Act (CWA), which governs the discharge of dredged or fill material into waters of the United States; section 10 of the Rivers and Harbors Act (RHA), which regulates any work or structures that potentially affect the navigable capacity of navigable waters of the United States; and section 14 of the RHA, which regulates the temporary occupation of water-related structures constructed by the United States.

The USACE elected to be a cooperating agency in the preparation of this EIS in accordance with NEPA and CEQ regulations in 40 CFR 1501.6. As a cooperating agency, the USACE would adopt the EIS per 40 CFR 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied. As an element of its review, the USACE must consider whether the proposed projects represent the least environmentally damaging practicable alternative pursuant to the CWA section 404(b)(1) guidelines. The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics considering the overall purpose of ACP and SHP.

Although this document addresses environmental impacts associated with the proposed ACP and SHP as it relates to section 404 of the CWA and sections 10 and 14 of the RHA, it does not serve as a public notice for any of the USACE's permits.

1.2.2.3 U.S. Environmental Protection Agency

The EPA has delegated water quality certifications under section 401 of the CWA to individual state agencies, but the EPA may assume this authority if no state program exists, if the state program is not functioning adequately, or at the request of a state. The EPA also oversees the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the state agency, under section 402 of the CWA, for point-source discharge of water used for hydrostatic testing of pipelines into waterbodies. In addition, the EPA has the authority to review and veto the USACE decisions on section 404 permits.

The EPA also has jurisdictional authority to control air pollution under the Clean Air Act (CAA) (42 U.S.C. Chapter 85) by developing and enforcing rules and regulations for all entities that emit toxic substances into the air. Under this authority, the EPA has developed regulations for major sources of air pollution. The EPA has delegated the authority to implement these regulations to state and local agencies, who are also allowed to develop their own regulations for non-major sources. The EPA also establishes general conformity applicability thresholds, with which a federal agency can determine whether a specific action requires a general conformity assessment.

In addition to its permitting responsibilities, the EPA is required under section 309 of the CAA to review and publicly comment on the environmental impacts of major federal actions including actions that are the subject of draft and final EISs and responsible for implementing certain procedural provisions of the NEPA (e.g., publishing the Notices of Availability of the draft and final EISs in the *Federal Register*) to establish statutory timeframes for the environmental review process.

1.2.2.4 U.S. Fish and Wildlife Service

Atlantic's initially proposed route crossed the Great Dismal Swamp NWR and, as such, the FWS agreed to be a cooperating agency for the preparation of this EIS. Atlantic subsequently identified a proposed route that would avoid crossing the NWR. Since the issuance of the draft EIS, the FWS (West Virginia, Virginia, and North Carolina Field Offices) elected to participate as cooperating agency due to its responsibilities under the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA). The FWS also has special expertise regarding effects on fish and wildlife and other environmental values and works to conserve, protect, and recover species under the ESA.

1.2.2.5 West Virginia Department of Environmental Protection

The WVDEP is responsible for implementing and enforcing West Virginia's environmental regulations with respect to managing the state's air, land, and water resources. The Division of Water and Waste Management's (DWWM) mission is to preserve, protect, and enhance the state's watersheds for the benefit and safety of all its citizens through implementation of programs controlling hazardous waste, solid waste, and surface and groundwater pollution from any source. The DWWM may grant, grant with conditions, waive, or deny a Water Quality Certificate application under section 401 of the CWA, and operates in accordance with 47 Code of State Rules (CSR) 5A. Section 401 Water Quality Certification is required for each permit or license issued by a federal agency to ensure that projects do not violate the state's water quality standards or stream designated uses. The WVDEP's Division of Air Quality implements the permit program established under the West Virginia's Air Pollution Control Act. Major emission sources are primarily permitted under the new source review rules found at 45 CSR 14 and 45 CSR 19. Under 45 CSR 30, the Division issues Operating Permits for Title V of the CAA. Table 1.4-1 in section 1.4 lists the WVDEP environmental permits, licenses, approvals, and consultations that are applicable for ACP and SHP.

In addition to serving as a regulatory role for the proposed project, the WVDEP has requested to be a cooperating agency to lend experience and insight concerning environmental impacts relative to this type of proposed action, and to provide recommendations on assessment, minimization, and mitigation of potential environmental impacts.

1.2.2.6 West Virginia Division of Natural Resources

The statutory mission of the WVDNR is to provide and administer a long-range comprehensive program for the exploration, conservation, development, protection, enjoyment, and use of the natural resources of the State of West Virginia. The WVDNR is composed of Wildlife Resources Section (WRS), State Parks and Forests Section, and Law Enforcement Section, and the Office of Lands and Streams. In addition, the FS and WVDNR cooperate on the management of wildlife and fisheries within the MNF.

Under State Code §20-2-1, "It is declared to be the public policy of the State of West Virginia that the wildlife resources of this state shall be protected for the use and enjoyment of all the citizens of the State. All species of wildlife shall be maintained for values which may be either intrinsic or ecological or of benefit to man. Such benefits shall include (1) hunting, fishing, and other diversified recreational uses; (2) economic contributions in the best interests of the people of this state; and (3) scientific and educational uses."

The WRS is responsible for management of the state's wildlife resources. The primary objective of the WRS is to maintain and perpetuate fish and wildlife at levels compatible with the available habitat while providing maximum opportunities for recreation, research, and education. The WRS is comprised of Game Management, Fisheries, Wildlife Diversity, Technical Support, and Environmental Coordination Units.

The WRS Environmental Coordination Unit reviews numerous projects that potentially impact wildlife, fisheries, and their respective habitats. Primary concerns are road construction, stream alteration, hydropower projects, power line rights-of-way, gas line construction, oil/gas well sites, surface mines, and other construction projects. In numerous cases, the Coordination Unit has made recommendations to alter projects to reduce detrimental impacts on wildlife and fisheries. The Technical Support unit provides Geographic Information System (GIS) and computer support to all biologists in the agency.

Currently, the Game Management Unit conducts management activities on 105 Wildlife Management Areas and 8 State Forests totaling 1,415,839 acres. Black bear, white-tailed deer, and wild turkey are some of the most important hunted game species. Impacts on property managed by the WRS may be subject to review by the FWS for concurrence under the authority established in 50 CFR 80.

Fisheries management programs are designed to provide a variety of fishing opportunities and experiences for the enjoyment of anglers. These programs consist of efforts focused on warmwater species (e.g., walleye and channel catfish), and coldwater species (e.g., trout), that are stocked in rivers, lakes, reservoirs, and streams throughout the state. Research, stocking, public access development, regulations, and outreach combined with habitat protection, improvement, and restoration form the foundation of management of the state's fishery resources.

The Wildlife Diversity and Natural Heritage Program is responsible for those species listed by the federal government as threatened or endangered, as well as nongame wildlife, nongame fish, mussels, birds, and their habitats. It also administers outreach programs and provides vital assessment information.

The State Parks and Forests Section promotes conservation by preserving and protecting natural areas of unique or exceptional scenic, scientific, cultural, archaeological, or historical significance and to provide outdoor recreational opportunities for the citizens of this state and its visitors. The system is composed of 35 parks, 7 forests, 5 wildlife management areas, the Greenbrier River Trail, and the North Bend Rail Trail.

The Office of Lands and Streams (OLS) preserves, protects, and enhances the State's title to its recreation lands. Currently, the WVDNR holds title to the beds of the state's rivers, creeks, and streams totaling some 34,000 miles or some 5,000 named waterways in the state. The OLS grants right-of-entry letters to governmental agencies, companies, and individuals to conduct construction activities in the state's rivers, creeks, and streams as well as right-of-way licenses for pipelines, underground or underwater cables, and overhead power and telephone lines crossing the state's waterways.

The Law Enforcement Section is responsible for the prompt, orderly, and effective enforcement of all laws of Chapter 20, Code of West Virginia, and rules promulgated under that authority. Of primary importance is the protection of West Virginia's wildlife to the degree that wildlife is not endangered by unlawful activities.

For the portion of ACP that crosses the Seneca State Forest and SHP that crosses the Lewis Wetzel Wildlife Management Area (WMA), and as stated in its comments on the draft EIS, the NPS notes that while the responsibility for compliance with the provisions of the Land and Water Conservation Fund (LWCF) Act rests with the state, the state in turn consults with the NPS for guidance and to sort out details of the proposal; therefore, NPS concurrence is needed for the Seneca State Forest and Lewis Wetzel WMA crossings. The WVDNR would require a license agreement containing pertinent mitigative stipulations for ACP and SHP to cross the Seneca State Forest and Lewis Wetzel WMA. Additionally, the WVDNR would require a license agreement for SHP to cross the North Bend Rail Trail and for ACP to cross the Greenbrier River Trail, which may include any pertinent mitigation deemed necessary by the WVDNR. Table 1.4-1 in section 1.4 lists the WVDNR environmental permits, licenses, approvals, and consultations that would be applicable for ACP and SHP.

1.3 PUBLIC REVIEW AND COMMENT

On October 31, 2014, Atlantic and DETI filed requests to implement the Commission's Pre-filing Process for ACP and SHP. FERC established its Pre-filing Process to encourage early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve environmental issues before an application is filed with the FERC and facility locations are formally proposed. FERC granted Atlantic's and DETI's requests to use the Pre-filing Process on November 13, 2014, and established pre-filing Docket Nos. PF15-6-000 and PF15-5-000 for the projects, respectively. At that time, we selected Merjent, Inc. (Merjent) as our third-party environmental contractor to assist us in the preparation of this EIS.[9] Merjent staff also attended open houses, public meetings, reviewed Resource Reports, and drafted environmental information request questions.

Prior to and during the Pre-filing Process, Atlantic and DETI contacted federal, state, and local agencies to inform them about their respective projects and discuss project-specific issues and concerns. Atlantic and DETI also developed a *Public and Agency Participation Plan* to facilitate stakeholder communications and make information available to the public and regulatory agencies. The *Public and Agency Participation Plan* established a single point of contact within Atlantic's and DETI's organizations for the public or agencies to call or e-mail with questions or concerns; a publicly accessible website with information about their projects (including maps) and project status; regular newsletter mailings for affected landowners and other interested parties; and a schedule for public open house meetings near ACP and SHP.

Atlantic and DETI initiated contact with potentially affected landowners prior to entering the FERC Pre-filing Process. These initial contacts were in the form of a letter describing Atlantic's and DETI's projects and seeking permission to conduct environmental and cultural resource surveys on landowner property.

As part of the Pre-filing Process, Atlantic and DETI hosted 13 public open house meetings in the project area in January 2015 (3 in North Carolina, 6 in Virginia, 3 in West Virginia, and 1 in Pennsylvania); 3 open houses in March 2015 (2 in Virginia and 1 in West Virginia); and 1 open house in July 2015 (in Virginia). The purpose of the public open house meetings was to inform landowners, government officials, and the public about ACP and SHP components and invite them to ask questions and express their concerns. FERC staff participated in the meetings and provided information regarding NEPA and the FERC's environmental review process.

On February 27, 2015, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Supply Header Project and Atlantic Coast Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI) that explained the Pre-filing Process; generally described the planned ACP and SHP; provided a preliminary list of issues identified by the FERC staff; requested written comments from the public; announced the time and location of 10 public scoping meetings; and asked other federal, state, and local agencies with jurisdiction and/or special expertise to cooperate with the FERC in the preparation of the EIS. The NOI was sent to 6,613 parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in ACP and SHP. The NOI was also published in the Federal Register on March 6, 2015.[10] Issuance of the NOI opened a 60-day formal scoping period for filing written comments on ACP and SHP; however, all relevant comments we received prior to issuance of the EIS have been considered.

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[9] Third-party contractors are selected by Commission staff and funded by project applicants. Third-party contractors work solely under the direction of FERC staff, who directs the scope, content, quality, and schedule of the contractor's work. FERC staff independently evaluates the results of the third-party contractor's work, and the Commission, through its staff, bears ultimate responsibility for full compliance with the requirements of NEPA.

[10] 80 Fed. Reg. 12,163 (2015).

In March 2015, the FERC held 10 public scoping meetings during the formal scoping period to provide the public with the opportunity to learn more about ACP and SHP and present oral comments on environmental issues that should be addressed in the EIS. The scoping meetings were held in Fayetteville, Wilson, and Roanoke Rapids, North Carolina; Chesapeake, Dinwiddie, Farmville, Lovingston, and Stuarts Draft, Virginia; and Elkins and Bridgeport, West Virginia. Approximately 1,525 people attended the public scoping meetings, including representatives from the FERC, cooperating agencies, and Atlantic and DETI. A total of 330 attendees provided oral comments at the meetings. Transcripts of each meeting and all written comments filed with the FERC are part of the public record for ACP and SHP and are available for viewing on the FERC Internet website (www.ferc.gov).[11]

On August 5, 2015, the FERC issued a *Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Atlantic Coast Pipeline Project, and Request for Comments on Environmental Issues Related to New Alternatives Under Consideration* that described three route alternatives for ACP in Virginia. The supplemental NOI was sent to 618 parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the area of the potential alternatives. The supplemental NOI was published in the Federal Register on August 11, 2015.[12] Issuance of the supplemental NOI opened a 30-day formal supplemental scoping period for filing written comments on the alternatives under consideration.

In addition to our formal notices, on June 18, 2015 and August 8, 2016, we mailed project update newsletters to provide stakeholders current information on FERC's environmental review of the projects and instructions on how comments could be filed with the Commission.

To assist in our review, we visited certain areas that could be affected by ACP and SHP and met with various groups and landowners. We also inspected the remainder of ACP and SHP area via automobile and helicopter in conjunction with open houses, public scoping meetings, and other meetings, and held meetings with various resource, permitting, and land management agencies.

On October 2, 2015, the FERC issued a *Notice of Application* announcing that Atlantic and DETI had filed applications with the FERC on September 18, 2015; this notice opened a defined period for parties to file for intervenor status. The *Notice of Application* was also published in the Federal Register on October 8, 2015.[13]

On November 13, 2015, the FERC mailed letters to potentially affected landowners along seven new route modifications along the ACP route in West Virginia, Virginia, and North Carolina. The letter requested comments be filed by December 14, 2015.

On March 22, 2016, the FERC issued a *Notice of Amendment to Application* announcing that Atlantic had filed an amendment to its application with the FERC on March 14, 2016; this notice opened

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11 Public meeting transcripts and comment letters are available for viewing on the FERC Internet website (http://www.ferc.gov). Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket No." field (i.e., PF15-5 or CP15-555 for SHP; or PF15-6 or CP15-554 for ACP). Select an appropriate date range.

12 80 Fed. Reg. 48,093 (2015).

13 80 Fed. Reg. 60,886 (2015).

another period for intervention. The *Notice of Amendment to Application* was published in the Federal Register on March 31, 2016.[14]

On May 3, 2016, the FERC issued a *Supplemental Notice of Intent to Prepare an Environmental Impact Statement and Proposed Land and Resource Plan Amendment(s) for the Proposed Atlantic Coast Pipeline, Request for Comments on Environmental Issues Related to New Route and Facility Modifications, and Notice of Public Scoping Meetings* that described the route modifications identified in Atlantic's amended application and announced the time and location of two additional public scoping meetings. In addition, the second supplemental NOI requested comments related to proposed actions of the FS, including potential LRMP amendments and for issuance of a right-of-way grant for the proposed ACP. The second supplemental NOI was sent to 9,694 parties, including federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had indicated an interest in the area of the potential alternatives. The second supplemental NOI was published in the Federal Register on May 9, 2016.[15] Issuance of the second supplemental NOI also opened a 30-day formal scoping and comment period for filing written comments on the alternatives under consideration and proposed LRMP amendments.

On May 20 and 21, 2016, the FERC held two public scoping/comment meetings during the formal supplemental scoping period to provide the public with the opportunity to learn more about the amended ACP application and present oral comments on environmental issues that should be addressed in the EIS and proposed LRMP amendments. The meetings were held in Marlinton, West Virginia and Hot Springs, Virginia. Approximately 250 people attended the public meetings, including representatives from the FERC, cooperating agencies, and Atlantic and DETI. A total of 147 attendees provided oral comments at the meetings. Transcripts of each meeting and all written comments filed with the FERC are part of the public record for ACP and SHP and are available for viewing on the FERC Internet website (www.ferc.gov).[16]

On May 11, 2016, the FERC mailed letters to potentially affected landowners along five new route modifications and six minor route adjustments along the ACP route in West Virginia and Virginia. The letter requested comments be filed by June 10, 2016.

On July 6, 2016, the FERC mailed letters to potentially affected landowners along 3 new route variations, 44 minor route adjustments, and several other minor route modifications along the ACP route in West Virginia and Virginia. The letter requested comments be filed by August 5, 2016.

On August 29, 2016, the FERC mailed letters to potentially affected landowners along a route variation under evaluation along ACP in Virginia that was developed by Atlantic in response to our request to have Atlantic identify an alternative route through the Rockfish Valley. The letter requested comments be filed by September 28, 2016.

In total, we received approximately 5,600 written comment letters during the Pre-filing Process, formal scoping and supplemental scoping periods, and throughout preparation of the EIS, including

[14] 81 Fed. Reg. 18,623 (2016).

[15] 81 Fed. Reg. 28,060 (2016).

[16] Public meeting transcripts and comment letters are available for viewing on the FERC Internet website (http://www.ferc.gov). Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket No." field (i.e., CP15-554 for ACP or CP15-555 for SHP). Select an appropriate date range.

approximately 3,200 form letters expressing opposition or support for the projects. Table 1.3-1 summarizes the environmental issues and concerns identified by the commentors during the scoping process and identifies the EIS section where each issue is addressed.

TABLE 1.3-1

Environmental Issues and Concerns Raised During Public Scoping for the Atlantic Coast Pipeline and Supply Header Project

Issue/Concern	EIS Section Addressing Issue
GENERAL	
Purpose and need for ACP and SHP	1.2
Need for a regional programmatic EIS	1.3
Adequacy of public outreach and number/length of scoping periods and comment meetings	1.3
Design and location of the pipeline, project schedule, land requirements, construction process and techniques	2.0
Construction monitoring and landowner notification and dispute resolution process	2.5, 4.8
Post-construction monitoring	2.5.6
Potential future expansion or abandonment of the pipeline	2.7
GEOLOGY	
Impacts on geological and fossil resources during construction, including impacts from blasting	4.1
Potential geologic hazards and mitigation	4.1.4
Importance and environmental sensitivity of karst terrain crossed by the project	4.1.2.3
Feasibility of construction in karst terrain	4.1.2.3
Potential for overland trench construction to initiate sinkhole development	4.1.2.3
Potential impact on cave systems from construction and operation	4.1.2.3
Potential impacts on karst terrain during construction, including from blasting	4.1.2.3
Karst mitigation measures	4.1.2.3
Potential for methane to disperse underground in karst regions	4.1.2.3
Impacts on mineral resources and mines	4.1.3
Feasibility of construction in steep terrain, including risk of landslides and erosion	4.1.4.2
Impacts from earthquakes, including construction across fault lines	4.1.4.1
Impacts associated with acid producing rock	4.1.4.4
SOILS	
Erosion impacts on soils; impacts of tree removal	4.2
Potential for increased erosion or landslides in steep slope areas	4.2.2.1, 4.2.2.8, 4.2.3
Impacts from soil compaction	4.2.2.3, 4.2.3
Impacts on agricultural activities and prime farmland	4.2.2.6, 4.2.3
Impacts on topsoil and methods to prevent topsoil/subsoil mixing	4.2.2.7, 4.2.3
Potential increase in flooding events from alteration of landscapes; impacts in floodplains	4.2.2, 4.3.2.3
Revegetation potential, including in steep slope areas and areas with erodible soils	4.2.2.5, 4.2.3, 4.4.3
Evaluation of hazardous waste sites and/or potential contamination encountered during construction	4.2.2.3, 4.8.7
Potential for soil contamination to occur during construction	4.2.3
WATER RESOURCES AND WETLANDS	
Impacts on groundwater, springs, wells, and drinking water supplies	4.3.1
Sedimentation impacts on groundwater and aquifers	4.3.1.7
Potential changes in groundwater flow from alterations to natural ground contours	4.3.1.7
Impacts from blasting on groundwater, including drinking water wells and springs	4.3.1.7
Impacts of construction on groundwater flow in karst terrain	4.3.1.7
Potential groundwater contamination from a pipeline leak during operation	4.3.1.7
Potential sediment impacts on karst terrain	4.3.1.7

TABLE 1.3-1 (cont'd)

Environmental Issues and Concerns Raised During Public Scoping for the Atlantic Coast Pipeline and Supply Header Project

Issue/Concern	EIS Section Addressing Issue
Impacts on waterbodies during construction, including from horizontal directional drill (HDD) activities and potential drilling mud releases	4.3.2.6
Potential waterbody contamination during construction	4.3.2.6
Potential waterbody contamination from a pipeline leak during operation	4.3.2.6
Sedimentation and erosion impacts on waterbodies during construction, including blasting	4.3.2.6
Impacts on livestock water supplies	4.3.2.4
Impacts from acidic waterbodies and iron-containing seeps	4.1.4.4, 4.3.2.6
Potential increase in flooding from changes in surface waters; impacts on pipeline from flooding events	4.3.2.3, 4.3.2.6
Impacts of tree removal on adjacent waterbodies	4.3.2.6
Water use impacts during construction, include hydrostatic testing	4.3.2.7
Potential for the pipeline trench to channel water/alter water flow following construction	2.3.2.6, 4.2.3, 4.3.1.7
Impacts on riparian habitat, including riparian buffers along waterbodies	4.3.2.6, 4.3.3.3, 4.3.3.5, 4.5, 4.6
Avoid/reduce impacts on wetlands, including restoration of surface flow patterns and flood buffers	4.3.3
Potential for invasion or spread of undesirable vegetation and noxious weeds during and after construction	4.3.3.5, 4.4.9
Need for compensatory wetland mitigation	4.3.3.8
VEGETATION, WILDLIFE, AND FISHERIES	
Impacts on local conservation and restoration activities and sites	4.3.3.3, 4.4.2, 4.8.5
Impacts on vegetation during operational maintenance, including use of herbicides and pesticides	4.4.4, 4.5.7
Impacts on forested land, including trees adjacent to the construction right-of-way	4.4.3, 4.5.6
Impacts on old growth forest	4.4.2, 4.4.8
Need for forest loss mitigation/replacement	4.4.3, 4.5.7
Impacts on shale barrens on NFS land	4.4.6, 4.4.7
Impacts on wildlife and their habitat, including forest habitat and shale barrens	4.5
Potential for wildlife to be displaced during construction	4.5
Impacts on pollinators and pollinator habitat	4.5.1.5
Impacts on migratory bird species	4.5.3
Impacts on deer	4.5
Potential for habitat fragmentation, including through forested areas	4.5.7
Air quality and noise impacts on wildlife	4.5.8
Impacts on aquatic and fish species during construction and operation	4.6
Impacts of HDD operations on aquatic species and habitat	4.6.4
SPECIAL STATUS SPECIES	
Potential impacts on federally listed or sensitive species or their habitat, including (but not limited to): Indiana bat, northern-long eared bat, Madison Cave isopod, and James spinymussel	4.7.1
Impacts on FS-Managed Species: Regional Forester Sensitive Species, Management Indicator Species, and Locally Rare Species, including (but not limited to): roughhead shiner, brook trout, rock vole, and West Virginia flying squirrel, and various bat and plant species	4.7.3
Impacts on state-listed or species of concern, including (but not limited to): golden-winged warbler, loggerhead shrike, northern water shrew, Barbara's buttons, and various salamander, bat, and plant species	4.7.4
LAND USE, RECREATION, AND VISUAL RESOURCES	
Impacts on timber activities	4.8.1.1
Impacts on agricultural land and activities, including livestock	4.8.1.1
Impacts on residences and private property rights during construction and operation, including landowner access during construction	4.8.2, 4.8.3
Legality of eminent domain and adequacy of easement payments	4.8.2
Compensation to landowners; easement and compensation process	4.8.2
Infringement on private property rights	4.8.2

TABLE 1.3-1 (cont'd)

Environmental Issues and Concerns Raised During Public Scoping for the Atlantic Coast Pipeline and Supply Header Project

Issue/Concern	EIS Section Addressing Issue
Impacts on residential features, including septic systems, wells, fences, trees, etc.	4.8.3
Impacts on local utilities	4.8.3
Conformity/consistency with local development plans	4.8.4
Limitation of right-of-way on land use	4.8.4
Impacts on potential future developments	4.8.4
Proximity to military facilities	4.8.5
Potential increase in off-highway vehicle use along the new right-of-way; unauthorized right-of-way access	4.8.5
Impacts on recreation, hunting, and tourism, including parklands and NFS lands	4.8.5, 4.8.9
Impacts on/consistency with existing conservation easements	4.8.5
Impacts on the special use areas and trails, including the Blue Ridge Parkway and ANST	4.8.5, 4.8.9
Impacts of construction near hazardous waste sites	4.8.7
Visual impacts of the pipeline right-of-way and aboveground facilities, including on NFS lands	4.8.8, 4.8.9
Consistency with the National Forest LRMPs	4.8.9
Impacts on federal lands, including national forests, national park lands, national landmarks	4.8.9
SOCIOECONOMICS	
Impacts on schools in the project area	4.9.4
Ability of local law enforcement and emergency response services during construction and operation, including the limited number and remote locations of emergency response services	4.9.4, 4.12.1
Potential economic impacts on local agricultural and tourism activities, including Yogaville	4.9.5
Impacts from construction-related traffic, including narrow existing roads	4.9.6
Impacts on existing roads and infrastructure from construction traffic	4.9.6
Impacts on property values/resale ability and property insurance coverage/rates	4.9.7
Economic benefits will be short term	4.9.8
Potential economic benefits to local communities	4.9.8
Potential impacts on future economic development	4.9.8
Potential lost business income during construction	4.9.8
Adequacy of economic impact studies	4.9.8
Impacts on environmental justice communities	4.9.9
CULTURAL RESOURCES	
Effects to known and undiscovered cultural resources and historic landscapes	4.10.1, 4.10.5
Impacts on historic cemeteries, including unmarked graves, family burials, and slave cemeteries	4.10.1
Impacts on historic features, including rock fences, roads/bridges, mines, paths/trails, etc.	4.10.1
Impacts on cultural resources associated with the Civil War	4.10.1
Impacts on historic structures and farms	4.10.1
Impacts on historic African-American sites	4.10.1
Impacts on historic districts	4.10.1
Impacts on Native American traditional lands in the project area	4.10.1, 4.10.4
Need for a cultural attachment assessment	4.10.1.1
Impacts on Yogaville	4.10.1.1
AIR QUALITY AND NOISE	
Effects of the project on air quality during construction and operation	4.11.1.3
Potential for nuisance fugitive dust generated during construction and operation	4.11.1.3
Potential air impacts from pipeline and compressor station leaks	4.11.1.3
Air quality impacts during blowdown events at compressor stations	4.11.1.3
Noise impacts during construction, including HDDs and blasting	4.11.2.2
Amplified construction noise due to mountains and valleys	4.11.2.2
Noise impacts from compressor station operation	4.11.2.2

TABLE 1.3-1 (cont'd) **Environmental Issues and Concerns Raised During Public Scoping for the Atlantic Coast Pipeline and Supply Header Project**	
Issue/Concern	EIS Section Addressing Issue
Vibration impacts from compressor station operation	4.11.2.2
Health impacts associated with audible and low-frequency noise during operation	4.11.2.2
Mitigation measures to reduce or eliminate noise from compressor station operation	4.11.2.2
RELIABILITY AND SAFETY	
Safety impacts in populated areas and near residences	4.12.1
Pipe materials specification	4.12.1
Pipeline monitoring during operation; safety oversight	4.12.1
Monitoring procedures in the event of a leak	4.12.1
Potential impacts from lightning strikes	4.12.2
Potential impacts from forest fires	4.12.1
Pipeline safety at road crossings	4.12.2
Potential for a leak or incident along the Blue Ridge Parkway/ANST HDD crossing; emergency response procedures	4.12.1
Emergency response procedures and the capabilities of local emergency service providers	4.12.1
Notification in the event of a pipeline incident	4.12.1
Limited evacuation routes along the right-of-way in the event of a pipeline incident	4.12.1
Impacts from pipe corrosion	4.12.1
Safety impacts from crossing karst terrain	4.1.2.3, 4.12.1
Previous safety record of the applicants	4.12.2
Potential impacts from terrorism	4.12.4
CUMULATIVE IMPACTS	
Potential impacts from nearby projects, including road projects, FERC-regulated pipeline projects, connected natural gas pipeline systems	4.13.1
Potential cumulative impacts from hydrostatic test water withdrawal	4.13.3.3
Downstream impacts on waterbodies originating in the project area	4.13.3.3
Potential cumulative impacts from forest/tree removal	4.13.3.4, 4.13.3.5
Potential cumulative impacts on trout and trout stream habitat	4.13.3.6
Indirect/off-right-of-way impacts on residences	4.13.3.8
Potential for increased greenhouse gas emissions to contribute to global warming	4.13.3.12
ALTERNATIVES	
Consider renewable energy and energy conservation alternatives	3.0
Route the proposed pipeline along existing energy, utility, railroad, or road corridors, including through the MNF and GWNF	3.3, 3.4
Route alternatives to avoid sensitive features	3.0
No-action alternative	3.1
Consider alternatives using existing or proposed natural gas transmission pipelines	3.2
Feasibility of HDD installation	3.3.4.3
Compressor station alternatives to avoid community and special interest area impacts	3.6.1

During scoping, we received comments that raised issues that are outside the scope of this EIS. For example, we received comments requesting that a programmatic EIS be prepared to address the potential combined impacts of ACP, MVP Project, and WB Express Project. Because the Commission does not have a program for or direct the development of the natural gas industry's infrastructure, either on a broad regional basis or in the design of specific projects, and does not engage in regional planning exercises that would result in the selection of one project over another, we have determined that it would not be appropriate to prepare a programmatic EIS. This EIS analyzes the project-specific impacts of ACP and SHP, and includes a discussion of cumulative impacts associated with other nearby actions affecting the environment in the same geographic scope (see section 4.13).

We received comments suggesting that ACP and SHP would lead to additional exploration and production of natural gas in the Marcellus shale region. According to some, this increased or “induced” production would correspondently result in more hydraulic drilling or “fracking.” The FERC does not regulate activities associated with the exploration and production of natural gas, including fracking. Those activities are regulated by individual states. While we know generally that natural gas is produced in the Appalachian Basin, there is no reasonable way to determine the exact wells providing gas transported in ACP and SHP pipelines, nor is there a reasonable way to identify the well-specific exploration and production methods used to obtain those gas supplies.

Because a natural gas transportation project is proposed before the FERC, it is not likely that it would lead to additional drilling and production. In fact, the opposite causal relationship is more likely; i.e., once production begins in an area, shippers or end users will support the development of a pipeline to move the natural gas to markets. In past proceedings, the Commission concluded that the environmental effects resulting from natural gas production are not linked to or caused by a proposed pipeline project.[17] Similarly here, we conclude that the environmental effects resulting from natural gas production are not caused by ACP and SHP, nor are they reasonably foreseeable consequences of ACP and SHP, as contemplated by CEQ. Therefore, natural gas production is not considered part of the proposed action in this EIS. However, natural gas production is considered in the context of potential cumulative impacts, within a defined geographic scope (see section 4.13).

Some comments were of an administrative nature. There were requests to hold more public scoping meetings and requests to extend the scoping period. As discussed above, our NOI and second supplemental NOI announced public scoping meetings that were held near the proposed ACP and SHP pipeline routes. The meeting locations were evenly spaced apart and selected within reasonable driving distance for most citizens in the project area, given facility and staff constraints, and areas of likely public interest. While scoping meetings are a valuable tool for us to receive verbal comments from the public, they are only one of several ways for interested persons to bring their concerns to the attention of the Commission. We equally consider written comments that are submitted electronically or through the mail.

As also discussed above, our NOI and supplemental NOIs established defined scoping periods with concluding dates; combined, our review of the projects has included 120 days of defined scoping periods. However, we continued to consider comments received after the close of the scoping periods, up until the time we completed our reviews of the applications, and drafted this EIS.

Many commentors object to the applicants’ future use of eminent domain (if certificated by the Commission). The Commission urges applicants to reach mutual agreements with landowners, and eminent domain should only be used as a last resort. The U.S. Congress conveyed the power of eminent domain to private companies that obtain a Certificate from the FERC when it passed section 7(h) of the NGA in 1947. In cases where agreements between a company and a landowner cannot be reached, compensation for an easement would be determined by local courts, not by the FERC or the applicants. The topic of property rights is briefly discussed in section 4.8.

We issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed Atlantic Coast Pipeline, Supply Header Project, and Capacity Lease Proposal* on December 30, 2016. The draft EIS was filed with the EPA, and a formal notice of availability was issued in the Federal

[17] *Central New York* Oil and Gas Co., LLC, 137 FERC ¶ 61,121, at PP 81-101 (2011), Order on Rehearing 138 FERC ¶ 61,104, at PP 33-49 (2012), Petition for Review Dismissed sub nom. Coalition for Responsible Growth v. FERC, 485 Fed. Appx. 472, 474-75 (2012) (unpublished opinion).

Register on January 9, 2017, indicating that the draft EIS was available.[18] The draft EIS was mailed to 9,805 parties, including federal, state, and local government agencies; elected officials; Native American tribes; affected landowners; local libraries and newspapers; intervenors in the FERC's proceeding; and other interested parties (i.e., miscellaneous individuals who provided scoping comments or asked to be on the mailing list). The distribution list was included as appendix A of the draft EIS. The notice of availability established a comment period on the draft EIS that ended on April 6, 2017. The notice described procedures for filing comments on the draft EIS and how information about ACP and SHP could be found on the FERC's website.

The FS issued a *Notice of Availability of the Atlantic Coast Pipeline Project and Supply Header Project Draft Environmental Impact Statement and the Forest Service Draft of Associated Land and Resource Management Plan Amendments* in the Federal Register on January 6, 2017.[19] Because the FS will use the EIS to review the project, in accordance with 36 CFR 219.16 (a)(2) the public had 90 days after the date of publication of the EPA's formal notice to submit comments on the draft EIS related to the FS. The FS' 90-day comment period ended on April 10, 2017.

We held 10 public comment sessions during the draft EIS comment period. The comment sessions were held in February and March 2017 in Fayetteville, Wilson, and Roanoke Rapids, North Carolina; Suffolk, Farmville, Lovingston, Staunton, and Monterey, Virginia; and Elkins and Marlinton, West Virginia. The comment sessions provided interested parties with an opportunity to present verbal comments on our analysis of the environmental impacts of the projects as described in the draft EIS. A total of 620 people commented at the sessions. In addition, 1,230 parties submitted a total of 1,675 timely letters in response to the draft EIS. Multiple form letters and petitions were also submitted in response to the draft EIS. The most commonly received comments on the draft EIS related to geologic hazards (including karst impacts and landslide potential), alternatives, socioeconomics, environmental justice, and air quality, as well as general comments regarding the FERC process and the purpose and need for the projects. All timely environmental comments on the draft EIS have been addressed in this final EIS. A transcript of each meeting and copies of each written comment are part of the public record for the projects. Our responses to relevant comments are provided in appendix Z of this final EIS. A subject index is provided in appendix AA. Substantive changes in the final EIS are indicated by vertical bars that appear in the margins. The changes were made both in response to comments received on the draft EIS and as a result of updated information that became available after the issuance of the draft EIS.

This final EIS is being mailed to the agencies, tribes, individuals, and organizations on the distribution list provided in appendix A, and was filed with the EPA for issuance of a formal public notice of availability in the Federal Register. In accordance with CEQ's regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the EPA publishes a notice of availability for this final EIS. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of this final EIS is published, allowing both periods to run concurrently. Should the Commission issue Certificates to the applicants for the proposed actions, they would be subject to a 30-day rehearing period. Therefore, the Commission could issue its decision concurrently with issuance of the final EIS. Section 1.2.2.1 includes a discussion of the FS' review process for the portion of ACP that crossed NFS lands.

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18 82 Fed. Reg. 2,348 (2017).

19 82 Fed. Reg. 1,685 (2017).

1.4 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

The FERC and other federal agencies that must make a decision on ACP and SHP are required to comply with federal statutes including the CWA, RHA, ESA, Magnuson-Stevens Fishery Conservation and Management Act (MSA), Coastal Zone Management Act (CZMA), MBTA, BGEPA, National Historic Preservation Act (NHPA), the CAA, NFMA, and NTSA. Each of these statutes has been considered in the preparation of this EIS.

The USACE has responsibility for determining compliance with the regulatory requirements of section 404 of the CWA, which regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Atlantic and DETI submitted nationwide permit (NWP) or USACE District specific general permit applications to the USACE in October 2015. An incomplete application letter was provided to Atlantic on October 15, 2015, for reasons related to jurisdiction, impact summary, impact justification, mitigation, historic properties, and endangered species. Presently the NWPs are under re-authorization. The USACE has indicated the current NWPs will expire on March 18, 2017. The USACE will fully evaluate which type of permit would be used when the new NWPs are issued and a complete permit application is received from each applicant. As noted in section 1.2.2.2, the USACE also has permitting responsibilities under section 10 of the RHA, which regulates navigable waters of the United States. Atlantic and DETI have applied for permits under section 10 of the RHA.

The EPA also independently reviews section 404 CWA wetland applications and has veto power for wetland permits issued by the USACE. The EPA has also delegated water quality certification under section 401 CWA and NPDES permitting under section 402 CWA to agencies in states crossed by ACP and SHP. Atlantic and DETI have indicated that they would obtain these permits from the appropriate agency in each affected state.

Section 7 of the ESA states that any project authorized, funded, or conducted by any federal agency (e.g., the FERC) should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…." The FERC, as the lead federal agency for review of ACP and SHP, is required to consult with the FWS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitats would be affected by ACP and SHP. Section 4.7.1 of this EIS contains our current analysis of ESA-listed and proposed endangered and threatened species and their designated critical habitats.

The MBTA implements various treaties and conventions between the United States, Mexico, Canada, Japan, and Russia for the protection of migratory birds. Birds protected under the MBTA include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs. The act makes it unlawful to pursue, hunt, take, capture, or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver, or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not, without a permit.

EO 13186 directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS. The EO states that emphasis should be placed on species of concern, priority habitats, and key risk factors and that focus should be given to addressing population-level impacts. On March 30, 2011, the FERC and FWS entered into a MOU regarding implementation of EO 13186. The memorandum focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies. This voluntary MOU does not waive legal requirements under the MBTA or any other statutes and does not authorize the take of migratory birds. This EIS discusses compliance with the MBTA in section 4.5.3.

The BGEPA prohibits taking without a permit, or taking with wanton disregard for the consequences of an activity, any bald or golden eagle or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA protections include provisions not included in the MBTA, such as the protection of unoccupied nests and a prohibition on disturbing eagles. The BGEPA includes limited exceptions to its prohibitions through a permitting process, including exceptions to take golden eagle nests that interfere with resource development or recovery operations. This EIS discusses compliance with the BGEPA in section 4.5.3.

The MSA established a management system for marine fishery resources in the United States and specifically directed the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries) and other bodies to identify essential fish habitat (EFH), which is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. This EIS discusses compliance with the MSA in section 4.6.3.

The CZMA is administered by NOAA and provides for the management of the nation's coastal resources. The CZMA requires that federal actions with reasonably foreseeable effects on coastal use and resources be reviewed for consistency with coastal management programs developed by each state. The entire SHP and the portions of ACP in West Virginia and North Carolina would not be in designated coastal zones. Portions of ACP in Virginia are designated as coastal zone for the purposes of CZMA consistency. This EIS discusses compliance with the CZMA in section 4.8.6.

Section 106 of the NHPA, as amended, requires FERC to take into account the effects of its undertakings on properties listed on or eligible for listing on the National Register of Historic Places (NRHP), including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance. FERC must also afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the effects of its undertakings. In accordance with the ACHP procedures, FERC, as the lead agency, is required to consult with cooperating agencies and the appropriate State Historic Preservation Offices (SHPO) regarding the NRHP eligibility of cultural resources and the potential effects of the proposed undertaking to those NRHP-listed or -eligible cultural resources. FERC has requested that Atlantic and DETI, as non-federal parties, assist in meeting FERC's obligations under section 106 by preparing the necessary information and analyses as required by the ACHP regulations in 36 CFR 800. This EIS discusses the status of this review in section 4.10.2.

Ambient air quality is protected by federal regulations under the CAA. These regulations include compliance under the New Source Performance Standards (NSPS) and requirements for the Prevention of Significant Deterioration (PSD). EPA has delegated the federal permitting process for the CAA to each state where ACP and SHP facilities are proposed. Although applications are reviewed by both the state and EPA, the state would determine the need for an NSPS or a PSD permit. Air quality and applicable regulations are discussed in section 4.11.

The NFMA of 1976 (Public Law 94-588) establishes the framework for development of the LRMPs developed for each national forest and establishes the requirement that all projects occurring on NFS lands must be consistent with the LRMP where the project occurs. The implementing regulations at 36 CFR 219 [2012] establish the process for revising and amending LRMPs.

The Blue Ridge Parkway (BRP) was authorized by an act of Congress on June 30, 1936 (Public Law 74-848 and Public Law 39 Statute 535). The parkway encompasses 82,000 acres of federal land, stretching 469 miles and connecting the Shenandoah National Park with Great Smoky Mountains National Park (NPS, 2013[20]). Recreational use and management of the BRP is discussed in section 4.8.9.2.

The ANST was designated as the first National Scenic Trail by an act of Congress on October 2, 1968 (NSTA, Public Law 90-543, as amended). The NPS was designated as the lead federal agency for the administration of the entire ANST, and tasked with working cooperatively with the ATC, local ATC-affiliated Trail Clubs, and more than 70 state and federal public-land managing agencies, including the FS, in the cooperative management of the ANST. Recreational use and management of the ANST is discussed in section 4.8.9.2.

A list of major environmental permits, approvals, and consultations for ACP and SHP is provided in table 1.4-1. Atlantic and DETI would be responsible for obtaining all permits and approvals required to construct and operate ACP and SHP, regardless of whether they appear in this table. FERC encourages cooperation between applicants and state and local authorities; however, state and local agencies, through the application of state and local laws, may not prohibit or unreasonably delay the construction or operation of facilities approved by FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by FERC.[21]

[20] Final Management Plan/EIS January 2013.

[21] *See* 15 U.S.C. § 717r(d) (state or federal agency's failure to act on a permit considered to be inconsistent with Federal law); *see also Schneidewind v. ANR Pipeline Co*., 485 U.S. 293, 310 (1988) (state regulation that interferes with FERC's regulatory authority over the transportation of natural gas is preempted) and *Dominion Transmission, Inc. v. Summers,* 723 F.3d 238, 245 (D.C. Cir. 2013) (noting that state and local regulation is preempted by the NGA to the extent it conflicts with federal regulation, or would delay the construction and operation of facilities approved by the Commission).

TABLE 1.4-1

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
FEDERAL					
FERC	Certificate under section 7(c) of the NGA and Authorization under section 7(b) of the NGA	September 2015	*Pending*	September 2015	*Pending*
Federal Aviation Administration	Notice of Proposed Construction or Authorization	November 2016	*October 2017*	NA	NA
	Supplemental Notice	November 2016	*October 2017*	NA	NA
Federal Communications Commission	Application for Wireless Telecommunications Bureau Radio Service Authority	November 2016	*October 2017*	NA	NA
NOAA – NMFS	Consultation under section 7 of the ESA and section 305 of the Magnuson-Stevens Act	August 2014	*September 2017*	NA	NA
	Consultation under the Marine Mammal Protection Act	August 2014	July 2016	NA	NA
NPS – BRP	Right-of-Way Grant and Special Use Permit to cross the BRP	September 2015	*September 2017*	NA	NA
NPS – ANST Office	Consultations regarding the proposed ANST crossing	February 2015	NA	NA	NA
USACE	Department of the Army Permits under section 404 of the CWA and section 10 of the RHA				
Huntington District		September 2015	*September 2017*	September 2015	*September 2017*
Pittsburgh District		September 2015	*September 2017*	September 2015	*September 2017*
Norfolk District		September 2015	*September 2017*	NA	NA
Wilmington District		September 2015	*September 2017*	NA	NA

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
FWS	Consultation under section 7 of the ESA				
West Virginia Ecological Field Services Office		August 2014	*September 2017*	October 2014	*September 2017*
Virginia Ecological Field Services Office		August 2014	*September 2017*	NA	NA
North Carolina Ecological Field Services Office		August 2014	*September 2017*	NA	NA
Pennsylvania Ecological Field Services Office		NA	NA	October 2014	*September 2017*
FS – GWNF including a crossing of the ANST	ROD to authorize the use of NFS lands on the GWNF ROD for GWNF LRMP amendments SUP for construction and operation of ACP on NFS lands in the GWNF	November 2015	*September 2017*	NA	NA
FS – MNF	ROD to authorize the use of NFS lands on the MNF ROD for MNF LRMP amendments if needed SUP for construction and operation of ACP on NFS lands in the MNF	November 2015	*September 2017*	NA	NA
Advisory Council on Historic Preservation	Consultation under section 106 of the NRHP	See below			
STATE					
West Virginia					
WVDEP					
Division of Air Quality	Air Permit – New Source Review Permit (or other applicable permit)	September 2015	May 2017	September 2015, *July 2017 (update)*	*Q4 2017*

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
DWWM	General Water Pollution Control Permit – Stormwater Associated with Construction Activities	March 2017	*Q3 2017*	March 2017	*Q3 2017*
DWWM	Water Quality Certificate under section 401 of the CWA	September 2015	*Q3 2017*	NA	NA
DWWM	NPDES– Water Pollution Control Permit for Hydrostatic Test Water – WV0113069	*Q2 2018*	*Q3 2018*	*August 2017*	*Q3 2017*
DWWM	Large Quantity User Water Use Registration	*July 2017*	*Q3 2017*	*August 2017*	*Q3 2017*
West Virginia Division of Culture and History	Consultation under section 106 of the NHPA	June 2014	*Q3 2017*	October 2014	*Q3 2017*
West Virginia Division of Natural Resources					
Natural Heritage Program	Natural Heritage/Protected Species Consultation	August 2014	*Q3 2017*	October 2014	*Q3 2017*
Office of Land and Streams	Stream Activity Permit (Joint Application with the Public Lands Corporation)	*Q3 2017*	*Q3 2017*	*Q3 2017*	*Q3 2017*
West Virginia Public Lands Corporation	Stream Activity Permit (Joint Application with the Division of Natural Resources)	*June 2017*	*Q3 2017*	*Q3 2017*	*Q3 2017*
County/City/Local	Floodplain Permit (expected to be required in all Counties/Cities along the routes)	*Q3 2017 – Q4 2017*	*Q2 2017 – Q3 2017*	*Q3 2017*	*Q3 2017*
Virginia					
Virginia Department of Agriculture and Consumer Services	Protected Species Consultation (plant species)	April 2016	*Q3 2017*	NA	NA
Virginia Department of Conservation and Recreation	Virginia Scenic Rivers Clearance	July 2015	*Q3 2017*	NA	NA

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
Virginia Department of Environmental Quality					
Coastal Zone Management Program	Consistency Determination under the Virginia Coastal Zone Management Program	September 2015, February 2017 (Update)	June 2017	NA	NA
Air Division	Air Permit – New Source Review Permit (or other applicable permit)	September 2015, May 2016 (Update), *July 2017 (Update)*	*Q4 2017*	NA	NA
Water Division	Water Quality Certificate under section 401 of the CWA (Joint Permit Application for the Water Quality Certificate, Virginia Water Protection Permit, River and Stream Crossing Permit, Department of the Army Permit, and Tidal Wetland Permit)	September 2015	*Q3 2017*	NA	NA
Water Division	Virginia Water Protection Permit (Joint Permit Application for the Water Quality Certificate, Virginia Water Protection Permit, River and Stream Crossing Permit, Department of the Army Permit, and Tidal Wetland Permit)	September 2015	*Q3 2017*	NA	NA
Water Division	General Permit for Discharges from Petroleum Contaminated Sites, Groundwater Remediation, and Hydrostatic Tests (VAG83)	*Q2 2018*	*Q3 2018*	NA	NA
Water Division	Soil and Erosion Plan and Variance for Open Trench Length	*July 2017*	*Q4 2017*	NA	NA

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
Office of Water Supply	Surface Water Withdrawal (Virginia Water Protection Permit)	NA	NA	NA	NA
Virginia Department of Game and Inland Fisheries	Natural Heritage/Protected Species Consultation	August 2014	*Q3 2017*	NA	NA
Virginia Department of Historical Resources	Consultation under section 106 of the NHPA	June 2014	*Q3 2017*	NA	NA
Virginia Department of Transportation	Land Use Permit	*Q3 2017*	*Q3 2017 – Q1 2018*	NA	NA
Virginia Marine Resources Commission	Submerged Lands Permit	September 2015	*Q3 2017*	NA	NA
Local Wetland Boards	Tidal Wetland Permit (Joint Permit Application for the Water Quality Certificate, Virginia Water Protection Permit, River and Stream Crossing Permit, Department of the Army Permit, and Tidal Wetland Permit)	September 2015	*Q3 2017*	NA	NA
County/City/Local	Floodplain Permit (expected to be required in all Counties/Cities along the routes)	*Q3 2017 – Q4 2017*	*Q2 2017 – Q3 2017*	NA	NA
County/City/Local	Special or Conditional Use Permit (expected to be required in Nelson and Buckingham Counties, and the Cities of Suffolk and Chesapeake)	*Q2 2017 – Q3 2017*	*Q3 2017*	NA	NA
North Carolina					
North Carolina Department of Natural and Cultural Resources					
Division of Air Quality	Air Permit – Stationary Source Construction and Operation Permit	September 2015, *July 2017 (Update)*	*September 2017*	NA	NA

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
Division of Energy, Mineral, and Land Resources (or approved local government)	General Permit NCG 010000 to Discharge Stormwater under the NPDES	December 2016	*Q3 2017*	NA	NA
Division of Water Resources	Water Quality Certificate under section 401 of the CWA (including permission to use State-owned bottom lands)	May 2017	*Q3 2017*	NA	NA
Division of Water Resources	Isolated and Other Non-404 Jurisdictional Wetlands and Waters Permit (including permission to use State-owned bottom lands)	September 2015	*Q3 2017*	NA	NA
Division of Water Resources	Buffer Authorization (for riparian zone disturbance)	September 2015	*Q3 2017*	NA	NA
Natural Heritage Program	Natural Heritage/Protected Species Consultation	August 2014	*Q3 2017*	NA	NA
North Carolina SHPO	Consultation under section 106 of the NHPA	June 2014	*Q3 2017*	NA	NA
North Carolina Wildlife Resources Commission	Protected Species Consultation	October 2014	*Q3 2017*	NA	NA
County/City/Local	Floodplain Permit (expected to be required in all Counties/Cities along the routes)	*Q3 2017 – Q4 2017*	*Q2 2017 – Q3 2017*	NA	NA
County/City/Local	Special or Conditional Use Permit (expected to be required in Northampton and Nash Counties)	*Q2 2017 – Q3 2017*	*Q3 2017*	NA	NA

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

Agency	Permit/Approval/Clearance	Atlantic Coast Pipeline		Supply Header Project	
		Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
Pennsylvania					
Pennsylvania Department of Environmental Protection					
Bureau of Air Quality	Air Quality Plan Approval	NA	NA	September 2015, September 2016 (Update), *July 2017 (Update)*	*Q4 2017*
Bureau of Waterways Engineering and Wetlands	Water Quality Certificate under section 401 of the CWA (issued jointly with chapter 105 Permit)	NA	NA	March 2017	*Q3 2017*
Bureau of Waterways Engineering and Wetlands	Chapter 105 Water Obstruction and Encroachment Permit	NA	NA	September 2015, March 2017 (Update)	*Q3 2017*
Bureau of Waterways Engineering and Wetlands	Submerged Land License Agreement (issued jointly with chapter 105 Permit)	NA	NA	September 2015, March 2017 (Update)	*Q3 2017*
Bureau of Point and Non-Point Source Management	NPDES – Hydrostatic Testing Water Discharge General Permit – PAG-10	NA	NA	March 2017	*Q3 2017*
Bureau of Safe Drinking Water	Chapter 110 Water Withdrawal and Use Registration	NA	NA	*July 2017*	*Q3 2017*
Pennsylvania Department of Conservation and Natural Resources	Natural Heritage/Protected Species Consultation	NA	NA	October 2014	September 2016
Pennsylvania Game Commission					
Pennsylvania Fish and Boat Commission					
Pennsylvania Historical and Museum Commission, Bureau for Historic Preservation	Consultation under section 106 of the NHPA	NA	NA	October 2014	*Q3 2017*

TABLE 1.4-1 (cont'd)

Major Environmental Permits, Licenses, Approvals, and Consultations for the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline		Supply Header Project	
Agency	Permit/Approval/Clearance	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*	Initial Submittal Date *(Anticipated)* [a]	Receipt Date *(as anticipated by the applicant)*
Westmoreland Conservation District	Review of Erosion and Sediment Control Plan (required for chapter 105 Permit) and Issuance of ESCGP-2)	NA	NA	March 2017	*Q3 2017*
Greene County Conservation District	Review of Erosion and Sediment Control Plan and Issuance of ESCGP-2	NA	NA	March 2017	*Q3 2017*
County/Local	Floodplain Management Act	NA	NA	*Q3 2017*	*Q3 2017*

[a] Date of Atlantic's and DETI's initial application submittals.

[b] Note: Since 1995, the GWNF in central western Virginia and the Jefferson National Forest in southwestern Virginia have been administratively combined as the single: George Washington and Jefferson National Forests, managed by a single Forest Supervisor.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

ACP and SHP would involve construction and operation of underground natural gas transmission pipeline and associated aboveground facilities in Pennsylvania, West Virginia, Virginia, and North Carolina. ACP and SHP are shown on figures 2.1-1 and 2.1-2, respectively, and are depicted on U.S. Geological Survey (USGS) topographic base maps in appendix B. Atlantic and DETI also provided aerial photographic base maps, referred to as alignment sheets, depicting the proposed pipeline facilities and associated construction and operation rights-of-way. The alignment sheets can be accessed on our website at www.ferc.gov.[1] Additional maps and interactive internet webmaps are available on DETI's website that show the general location of the project route at www.dom.com/corporate/what-we-do/atlantic-coast-pipeline. The exact location data of the project facilities as reviewed by staff is shown on the alignment sheets.

ACP would cross West Virginia, Virginia, and North Carolina and involve the construction and operation of 2 mainline pipeline facilities, 3 pipeline laterals, 3 new compressor stations, 9 M&R stations, 41 valves, and 8 sets of pig launchers/receivers (see figure 2.1-1). ACP would deliver up to 1.5 Bcf/d to various customers in West Virginia, Virginia, and North Carolina as described in section 1.1.

SHP would cross Pennsylvania and West Virginia and involve the construction and operation of two pipeline loops and modifications to four existing compressor stations that are located along DETI's existing natural gas transmission system (see figure 2.1-2). SHP would deliver up to 1.5 Bcf/d to various customers, including Atlantic. DETI also proposes to abandon in place two existing gathering compressor units (Hasting Compressor Units 1 and 2; see section 2.8) at its existing Hastings Compressor Station in Wetzel County, West Virginia and replace the units with two new compressor units at the existing Mockingbird Hill Compressor Station.

2.1.1 Pipeline Facilities

2.1.1.1 Atlantic Coast Pipeline

Atlantic would construct and operate 604.5 miles of natural gas transmission pipeline consisting of two mainline pipeline facilities and three pipeline laterals (see table 2.1.1-1). Portions of the AP-1 mainline would cross the MNF (5.2 miles in Pocahontas County, West Virginia) and the GWNF (16.0 miles in Highland, Bath, and Augusta Counties, Virginia). In addition, the AP-1 mainline would cross approximately 0.1 mile of the BRP and ANST using the horizontal directional drill (HDD) method in Augusta and Nelson Counties, Virginia. Each pipeline facility is discussed in further detail below. The land requirements for ACP pipeline facilities are summarized in section 2.2. Section 4.8.9 includes a description of federal lands affected by ACP.

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[1] Atlantic's and DETI's alignment sheets can be found under FERC Accession No. 20160729-5108.

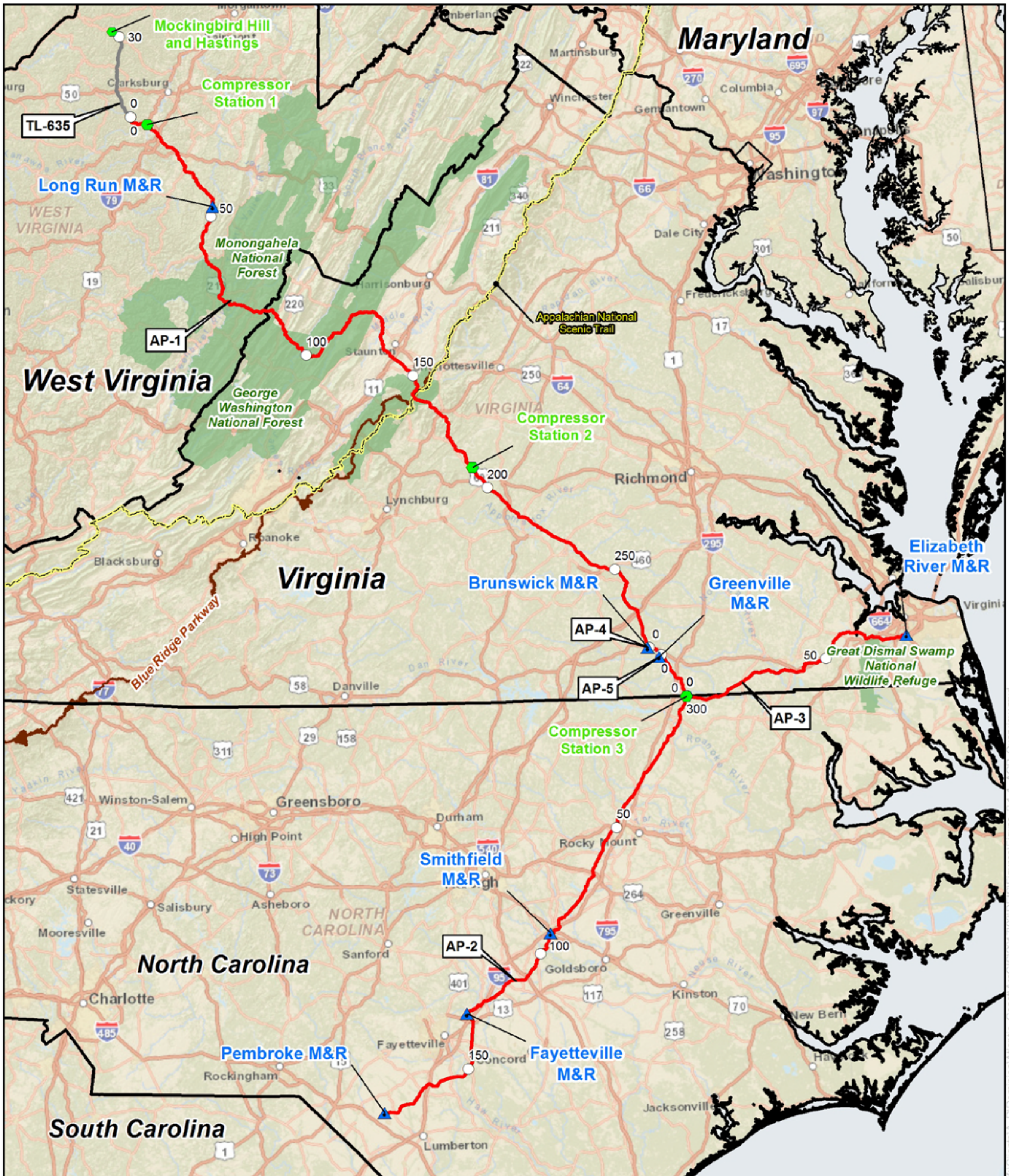

Figure 2.1-1
Project Overview
Atlantic Coast Pipeline

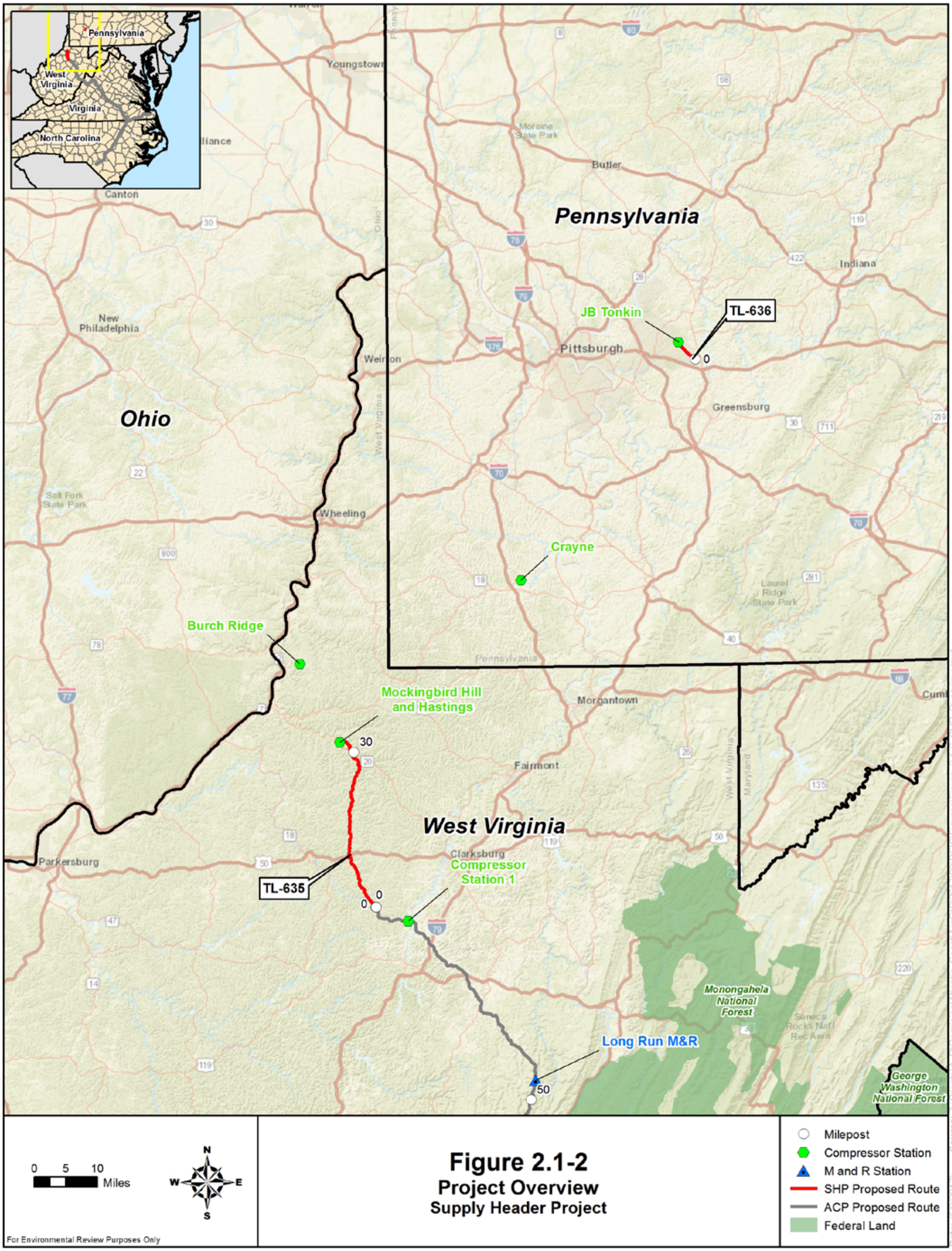

Figure 2.1-2
Project Overview
Supply Header Project

TABLE 2.1.1-1

Pipeline Facilities for the Atlantic Coast Pipeline

Pipeline Facility	County/City, State/Commonwealth	Pipe Diameter (inches)	Milepost Range	Length (miles) [a, b]
AP-1 Mainline	Harrison County, WV	42	0.0-1.1	1.1
	Lewis County, WV	42	1.1-21.4	19.9
	Upshur County, WV	42	21.4-43.9	22.2
	Randolph County, WV	42	43.9-66.6	30.3
	Pocahontas County, WV [c]	42	66.6-83.9	25.3
	Highland County, VA [c]	42	83.9-91.6	11.0
	Bath County, VA [c]	42	91.6-106.8	22.6
	Augusta County, VA [c, d]	42	106.8-158.2	56.1
	Nelson County, VA [d]	42	158.2-184.7	27.6
	Buckingham County, VA	42	184.7-211.8	27.8
	Cumberland County, VA	42	211.8-220.8	9.1
	Prince Edward County, VA	42	220.8-225.9	5.2
	Nottoway County, VA	42	225.9-249.0	23.5
	Dinwiddie County, VA	42	249.0-260.7	11.8
	Brunswick County, VA	42	260.7-283.0	22.6
	Greensville County, VA	42	283.0-300.1	17.5
	Northampton County, NC	42	300.1-300.2	<0.1
	Subtotal			**333.4**
AP-2 Mainline	Northampton County, NC	36	0.0-9.9	10.0
	Halifax County, NC	36	9.9-33.9	24.34
	Nash County, NC	36	33.9-65.8	32.0
	Wilson County, NC	36	65.8-77.7	12.0
	Johnston County, NC	36	77.7-114.9	38.1
	Sampson County, NC	36	114.9-122.7	7.8
	Cumberland County, NC	36	122.7-160.5	39.7
	Robeson County, NC	36	160.5-182.9	22.4
	Subtotal			**186.3**
AP-3 Lateral	Northampton County, NC	20	0.0-12.2	12.3
	Greensville County, VA	20	12.2-12.4	0.2
	Southampton, County VA	20	12.4-38.6	26.3
	City of Suffolk, VA	20	38.6-71.4	33.3
	City of Chesapeake, VA	20	71.4-82.7	11.3
	Subtotal			**83.4**
AP-4 Lateral	Brunswick County, VA	16	0.0-0.4	0.4
	Subtotal			**0.4**
AP-5 Lateral	Greensville County, VA	16	0.0-1.0	1.0
	Subtotal			**1.0**
	Atlantic Coast Pipeline Total			**604.5**

a The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

b The straight-line distance between consecutive mileposts may be greater than or less than 5,280 feet due to the adoption of route alternatives and variations. The mileposts should be considered as reference points only.

c Includes NFS lands. See section 4.8.9 for a detailed description of federal lands crossed by ACP.

d Includes the HDD crossing of the BRP and ANST. See section 4.8.9 for a detailed description of federal lands crossed by ACP.

AP-1 Mainline

The AP-1 mainline would originate at the terminus of the TL-635 loopline in Harrison County, West Virginia and extend to the southeast through Virginia to its terminus near the border of Virginia and North Carolina in Northampton County, North Carolina and the proposed location of Compressor Station 3. The AP-1 mainline would transport up to 1.5 Bcf/d of natural gas to multiple delivery points along its route. The proposed maximum allowable operating pressure (MAOP)[2] of the AP-1 mainline is 1,440 pounds per square inch gauge (psig).

AP-2 Mainline

The AP-2 mainline would originate at Compressor Station 3 in Northampton County, North Carolina and extend to the southwest to an interconnect point with an existing Piedmont pipeline system in Robeson County, North Carolina. The AP-2 mainline would transport natural gas to the Piedmont pipeline system at three delivery points along its route. The proposed MAOP of the AP-2 mainline is 1,440 psig.

AP-3 Lateral

The AP-3 lateral would originate at Compressor Station 3 in Northampton County, North Carolina and extend to the east to an interconnect point with an existing Virginia Natural Gas pipeline system in the City of Chesapeake, Virginia. The AP-3 lateral would transport natural gas to the Virginia Natural Gas pipeline system. The proposed MAOP of the AP-3 lateral is 1,440 psig.

AP-4 Lateral

The AP-4 lateral would originate at an interconnect point with the AP-1 mainline in near Lawrenceville in Brunswick County, Virginia and extend west to Dominion Virginia Power's 1,358-megawatt (MW) Brunswick Power Station that is currently under construction (see sections 2.8 and 4.13 for additional information on this nonjurisdictional facility). The AP-4 lateral would transport natural gas to the electric generating facility. The proposed MAOP of the AP-4 lateral is 1,440 psig.

AP-5 Lateral

The AP-5 lateral would originate at an interconnect point with the AP-1 mainline in Greensville County, Virginia and extend south/southwest to a proposed 1,600-MW Greensville Power Station that began construction in June 2016 (see sections 2.8 and 4.13 for additional information on this nonjurisdictional facility). The AP-5 lateral would transport natural gas to the electric generating facility. The proposed MAOP of the AP-5 lateral is 1,440 psig.

2.1.1.2 Supply Header Project

DETI proposes to construct and operate two separate natural gas pipeline loops along its existing natural gas transmission pipeline system (see table 2.1.1-2). The TL-636 loopline would originate at the existing JB Tonkin Compressor Station and extend to the southeast to an interconnect point with DETI's existing TL-591 pipeline system. The TL-635 loopline would originate at the existing Mockingbird Hill

[2] The MAOP is the highest pressure at which a pipeline may be operated under DOT regulations (49 CFR 192). The MAOP is based on a pipeline's strength and design characteristics and is lower than the maximum pressure for which the pipeline is engineered.

Compressor Station and extend to the south/southeast to an interconnect point with the proposed ACP. Each pipeline loop would have a MAOP of 1,440 psig. The land requirements for SHP pipeline facilities are summarized in section 2.2.

TABLE 2.1.1-2

Pipeline Facilities for the Supply Header Project

Pipeline Loop	County, State/Commonwealth	Pipe Diameter (inches)	Milepost Range	Length (miles)
TL-636 Loopline	Westmoreland, PA	30	0-3.9	3.9
	Subtotal			**3.9**
TL-635 Loopline	Harrison County, WV	30	0-0.6	0.6
	Doddridge County, WV	30	0.6-22.8	22.2
	Tyler County, WV	30	22.8-23.6	0.8
	Wetzel County, WV	30	23.6-33.6	10.0
	Subtotal			**33.6**
	Supply Header Project Total			**37.5**

2.1.2 Aboveground Facilities

Aboveground facilities associated with ACP and SHP are described in the sections below. All the aboveground facilities would be within or generally adjacent to ACP and SHP rights-of-way. Other minor appurtenant facilities may be installed but are not included in following discussions and tables.

2.1.2.1 Compressor Stations

Table 2.1.2-1 lists the new and modified compressor stations associated with ACP and SHP. No compressor station facilities would be located on NFS lands. Compressor stations utilize engines to maintain pressure within the pipeline to deliver the contracted volumes of natural gas to specific points at specific pressures. Compressors are housed in buildings that are designed to attenuate noise and allow for operation and maintenance activities. Compressor stations also typically include administrative, maintenance, storage, and communications buildings, and can include M&R stations and pig launcher/ receiver facilities, as discussed below. Most stations consist of a developed, fenced area within a larger parcel of land that remains undeveloped. The location of the compressor station and amount of compression needed are determined primarily by hydraulic modeling. The general construction and operation procedures for the compressor stations are discussed in sections 2.3.4 and 2.6.2, respectively. Regulatory requirements and impacts on air quality and noise associated with the compressor stations are discussed in section 4.11.

In addition, DETI is proposing to abandon in place existing gathering compressor units 1 and 2 at the Hastings Compressor Station and replace the units with two new compressor units at the existing Mockingbird Hill Compressor Station. In 2006, the Commission approved a request from DETI to re-functionalize the units from transmission to gathering, but denied a request to abandon the units for transmission.[3] In the 2006 Order, the Commission concluded that because DETI would continue to use the compressor units, its request for abandonment was premature and unnecessary. The 2006 Order said that DETI would need to seek abandonment authority from the Commission under section 7(b) of the NGA in a future proceeding if and when use of the existing units is discontinued. DETI is now seeking authorization under section 7(b) of the NGA to abandon the gathering compressor units at the Hastings Compressor Station (see section 2.8).

[3] DTI, 114 FERC ¶ 61,266 (2006)

TABLE 2.1.2-1

Compressor Station Facilities for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County, State/ Commonwealth	Milepost	Description
Atlantic Coast Pipeline – New Compressor Stations			
AP-1 Mainline			
Compressor Station 1	Lewis County, WV	7.5	Construct new 55,015 horsepower (hp) station that would take natural gas from the proposed Kincheloe M&R Station and discharge into the AP-1 mainline. Install four gas-driven compressor units, filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Construct new compressor, office auxiliary, utility gas, drum storage, and storage buildings.
Compressor Station 2	Buckingham County, VA	191.5	Construct new 53,518 hp station that would move gas through the proposed AP-1 mainline and allow bidirectional flow with the existing Transco pipeline system. Install four gas-driven compressor units, filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Construct new compressor, office auxiliary, utility gas, drum storage, and storage buildings.
Compressor Station 3	Northampton County, NC	300.2	Construct new 21,815 hp station that would take gas from the AP-1 mainline and discharge into both the AP-2 mainline and the AP-3 lateral. Install three gas-driven compressor units, filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators. Construct two new compressor buildings and office auxiliary, utility gas, drum storage, and storage buildings.
Supply Header Project – Compressor Station Modifications			
JB Tonkin Compressor Station	Westmoreland County, PA	3.9	Install one new gas-driven compressor unit; install gas filter/ separator, gas cooler, inlet air filter, exhaust silencer, tanks, blowdown silencers, heaters, and auxiliary generator; construct one new compressor building, one new ancillary building, one new utility gas building, and one new motor control center/ controls building. A total of 20,500 hp would be added to this station.
Crayne Compressor Station	Greene County, PA	NA	Install one new gas-driven compressor unit; install gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators; and expand the existing compressor station building. A total of 7,700 hp would be added to this station.
Burch Ridge Compressor Station	Marshall County, WV	NA	Install crossover piping to allow for bi-directional flow between DETI's TL-590 and TL-377 pipelines. No additional compression is proposed.
Mockingbird Hill Compressor Station	Wetzel County, WV	33.6	Install two new gas-driven compressor units; install gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, heaters, and auxiliary generators; and construct new compressor, auxiliary, utility gas, drum storage, and storage buildings. A net total of 41,000 hp would be added to this station.
Hastings Compressor Station	Wetzel County, WV	NA	Abandon in place existing gathering compressor units 1 and 2 at the Hastings Compressor Station; replace the units with two new compressor units at the existing Mockingbird Hill Compressor Station. [a]

[a] Additional discussion of the nonjurisdictional replacement activities at this facility is provided in sections 2.8 and 4.13.

Note: No compressor station facilities would be located on NFS lands.

2.1.2.2 Metering and Regulating Stations

Table 2.1.2-2 lists the M&R stations associated with ACP and SHP. M&R stations measure the volume of gas removed from or added to a pipeline system at receipt and delivery interconnects. Most M&R stations consist of a small graveled area with small building(s) that enclose the measurement equipment. Nine M&R stations are proposed for ACP and one M&R station is proposed for SHP. No M&R stations would be located on NFS lands.

TABLE 2.1.2-2

M&R Stations for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County, State/ Commonwealth	Milepost	Description
Atlantic Coast Pipeline			
AP-1 Mainline			
Kincheloe M&R Station	Lewis County, WV	7.5	Station would take natural gas from DETI's existing TL-360 mainline and the proposed AP-1 mainline and discharge into Compressor Station 1.
Long Run M&R Station	Randolph County, WV	47.3	Station would take natural gas from the proposed AP-1 mainline and discharge into an existing Columbia Gas WB pipeline.
Woods Corner M&R Station [a]	Buckingham County, VA	191.6	Station would take natural gas from the proposed AP-1 mainline and the existing Transco pipelines and could discharge into these pipelines.
AP-2 Mainline			
Smithfield M&R Station	Johnston County, NC	92.7	Station would take natural gas from the proposed AP-2 mainline and discharge into an existing Piedmont pipeline.
Fayetteville M&R Station	Cumberland County, NC	132.9	Station would take natural gas from the proposed AP-2 mainline and discharge into an existing Piedmont pipeline.
Pembroke M&R Station	Robeson County, NC	182.9	Station would take natural gas from the proposed AP-2 mainline and discharge into an existing Piedmont pipeline.
AP-3 Lateral			
Elizabeth River M&R Station	City of Chesapeake, VA	82.7	Station would take natural gas from the proposed AP-3 lateral and discharge into an existing Virginia Natural Gas pipeline.
AP-4 Lateral			
Brunswick M&R Station	Brunswick County, VA	0.4	Station would take natural gas from the proposed AP-4 lateral and discharge to a Dominion Virginia Power (DVP) electric generating facility which currently is under construction.
AP-5 Lateral			
Greensville M&R Station	Greensville County, VA	1.0	Station would take natural gas from the proposed AP-5 lateral and discharge to a proposed DVP electric generating facility.
Supply Header Project			
CNX M&R Station	Lewis County, WV	NA	Station would enable natural gas receipts into DETI's existing TL-360 mainline.

[a] Natural gas would be received and delivered at Woods Corner M&R Station to meet the requirements of ACP customers for bi-directional flow as requested in the request for proposal from Duke Energy and Piedmont. This would create flexibility for ACP customers to utilize the existing transportation capacity portfolio on the Transco system. ACP customers may use existing capacity to deliver natural gas into ACP for delivery to their ACP delivery points, or use capacity on ACP and SHP systems to deliver natural gas into Transco for delivery to Transco delivery points.

Note: No M&R stations would be located on NFS lands.

2.1.2.3 Valves

Table 2.1.2-3 lists the valves associated with ACP and SHP. No valves would be located on NFS lands. Valves consist of a small system of aboveground and underground piping and valves that control the flow of gas within the pipeline and can also be used to vacate, or blow-off, the gas within a pipeline segment, if necessary. Most valves would be installed within the operational rights-of-way of the pipeline facilities. Valves can be located at interconnections within a transmission system (i.e., between a mainline pipeline and a loop) and at locations based on the DOT Class designation of the pipeline; in general, the distance between valves is reduced in areas of higher human population (see section 4.12.1).

2.1.2.4 Pig Launchers and Receivers

Table 2.1.2-4 lists the pig launchers and receivers associated with ACP and SHP. Pig launchers and receivers are facilities where internal pipeline cleaning and inspection tools, referred to as "pigs," could be inserted or retrieved from the pipeline. Pig launchers/receivers generally consist of a segment of aboveground piping, 20 to 30 feet in length, which ties into the mainline pipeline facilities below the ground surface. All pig launchers and receivers would be installed within the 50-foot-wide operational pipeline right-of-way, or within the compressor station, M&R station facilities, or valve sites, except for the launcher/receiver proposed at AP-1 milepost (MP) 105.6, which would extend outside the operational right-of-way. No pig launcher or receiver facilities would be located on NFS lands.

2.1.2.5 Cathodic Protection Systems

Table 2.1.2-5 lists the cathodic protection system facilities associated with ACP and SHP. Cathodic protection systems help prevent corrosion of underground pipeline facilities. These systems typically include a small, aboveground transformer-rectifier unit and an associated anode ground bed located underground. These cathodic protection facilities would be installed perpendicular to the pipeline right-of-way at lengths ranging from 535 to 1,010 feet. Installation of these facilities generally requires a 25-foot-wide workspace to install the cables and wires 30 inches below the ground surface. These facilities are often placed along roadsides or within agricultural fields. No cathodic protection system facilities would be located on NFS lands.

2.1.2.6 Communication Towers and Antennas

Table 2.1.2-6 lists the communication towers and antennas associated with ACP. Although these auxiliary installations do not require case-specific certificate authority for their construction and operation [see 18 CFR 2.55(a)], we are disclosing the location and potential impacts of these facilities throughout our environmental analysis. Currently, Atlantic anticipates that 10 of the proposed communication towers or antennas would be located within proposed compressor station, M&R station, or valve sites. The remaining communication towers and antennas would be located at facilities owned by Dominion, Duke, American Tower, and the Virginia State Police. The construction and operation of communication facilities that are located outside ACP or SHP work areas would require section 7 authorization; the leasing of space on existing towers would not require section 7 authorization. Two of the towers (Bath County Power Station and Rocky Mountain MW Site) would be located within existing authorized facilities (defined as a communication tower, electric substation, or electric generating station) on NFS lands; therefore, no additional authorization would be required from the FS. Further, Atlantic stated there would be no land disturbance required for installation of these new antennas. No communication towers are associated with SHP.

TABLE 2.1.2-3

Valves for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County/City, State/ Commonwealth	Milepost	Scope of Work
Atlantic Coast Pipeline [a]			
AP-1 Mainline			
Valve Site 0	Harrison County, WV	0.0	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 1	Lewis County, WV	7.5	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 2	Upshur County, WV	24.3	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 3	Upshur County, WV	41.3	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 4	Randolph County, WV	47.3	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 5	Randolph County, WV	59.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 6	Pocahontas County, WV	69.2	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 7	Pocahontas County, WV	81.0	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 8	Bath County, VA	93.2	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 9	Bath County, VA	105.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 10	Augusta County, VA	115.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 11	Augusta County, VA	130.8	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 12	Augusta County, VA	142.9	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 13	Nelson County, VA	149.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 14	Nelson County, VA	164.0	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 15	Nelson County, VA	178.4	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 16	Buckingham County, VA	191.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 17	Buckingham County, VA	206.3	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 18	Prince Edward County, VA	225.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 19	Nottoway County, VA	245.2	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 20	Brunswick County, VA	264.8	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 21	Brunswick County, VA	279.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 22	Greensville County, VA	284.4	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 22A	Northampton County, NC	300.2	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
AP-2 Mainline			
Valve Site 23	Northampton County, NC	9.4	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 24	Halifax County, NC	14.9	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 25	Nash County, NC	34.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.

TABLE 2.1.2-3 (cont'd)

Valves for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County/City, State/ Commonwealth	Milepost	Scope of Work
Valve Site 26	Nash County, NC	49.5	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 27	Nash County, NC	64.3	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 28	Johnston County, NC	78.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 28A	Johnston County, NC	92.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 29	Johnston County, NC	108.1	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 30	Cumberland County, NC	123.0	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 31	Cumberland County, NC	136.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 32	Cumberland County, NC	153.7	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 33	Robeson County, NC	168.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
AP-3 Lateral			
Valve Site 34	Southampton County, VA	19.5	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 35	City of Suffolk, VA	39.0	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 36	City of Suffolk, VA	58.5	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 37	City of Chesapeake, VA	71.6	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 38	City of Chesapeake, VA	77.5	Install valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Supply Header Project			
TL-636 Loopline			
Valero Gate Junction	Westmoreland County, PA	0.0	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
JB Tonkin Compressor Station	Westmoreland County, PA	3.9	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
TL-635 Loopline			
Marts Junction	Harrison County, WV	0.0	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 1	Doddridge County, WV	12.4	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Valve Site 2	Wetzel County, WV	29.6	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.
Mockingbird Hill Compressor Station	Wetzel County, WV	33.6	Install below grade valve with aboveground valve operators, risers, blowdown valves, and crossover piping.

[a] There are no valves along the AP-4 and AP-5 laterals.

Note: No valves would be located on NFS lands.

TABLE 2.1.2-4

Pig Launcher/Receiver Facilities for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County/City, State/ Commonwealth	Milepost	Scope of Work
Atlantic Coast Pipeline			
AP-1 Mainline			
Site 1 (launcher)	Harrison County, WV	0.0	Install a new pig launcher facility.
Site 2 (launcher/receiver)	Bath County, VA	105.6	Install a new pig launcher and receiver facility.
Site 3 (launcher/receiver)	Buckingham County, VA	191.6	Install a new pig launcher and receiver facility.
Site 4 (launcher/receiver)	Northampton County, NC	300.2	Install a new pig launcher and receiver facility.
AP-2 Mainline			
Site 5 (launcher/receiver)	Johnston County, NC	92.7	Install a new pig launcher and receiver facility.
Site 6 (receiver)	Robeson County, NC	182.9	Install a new pig receiver facility.
AP-3 Lateral			
Site 4 (launcher)	Northampton County, NC	0.0	Install a new pig launcher facility.
Site 7 (receiver)	City of Chesapeake, VA	82.7	Install a new pig receiver facility.
AP-4 Lateral			
Site 8 (launcher)	Brunswick County, VA	0.0	Install a new pig launcher facility.
Site 9 (receiver)	Brunswick County, VA	0.4	Install a new pig receiver facility.
AP-5 Lateral			
Site 10 (launcher)	Greensville County, VA	0.0	Install a new pig launcher facility.
Site 11 (receiver)	Greensville County, VA	1.0	Install a new pig receiver facility.
Supply Header Project			
TL-636 Loopline			
Valero Gate Junction (receiver)	Westmoreland County, PA	0.0	Install a new pig receiver facility.
JB Tonkin Compressor Station (launcher)	Westmoreland County, PA	3.9	Install a new pig launcher facility.
TL-635 Loopline			
Marts Junction (receiver)	Harrison County, WV	0.0	Install a new pig receiver facility.
Mockingbird Hill Compressor Station (launcher)	Wetzel County, WV	33.6	Install a new pig launcher facility.

Note: No pig launcher or receiver facilities would be located on NFS lands.

TABLE 2.1.2-5

Cathodic Protection System Facilities for the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Facility	County, State/ Commonwealth	Milepost	Scope of Work
Atlantic Coast Pipeline [a]			
AP-1 Mainline			
Ground Bed 1	Lewis County, WV	20.3	Install 620 feet of cathodic protection/ground bed.
Ground Bed 2	Upshur County, WV	29.1	Install 580 feet of cathodic protection/ground bed.
Ground Bed 3	Augusta County, VA	125.9	Install 890 feet of cathodic protection/ground bed.
Ground Bed 4	Augusta County, VA	140.7	Install 1,000 feet of cathodic protection/ground bed.
Ground Bed 5	Nelson County, VA	181.1	Install 890 feet of cathodic protection/ground bed.
Ground Bed 6	Cumberland County, VA	213.5	Install 650 feet of cathodic protection/ground bed.
Ground Bed 7	Nottoway County, VA	235.6	Install 760 feet of cathodic protection/ground bed.
Ground Bed 8	Dinwiddie County, VA	257.6	Install 910 feet of cathodic protection/ground bed.
Ground Bed 9	Brunswick County, VA	263.9	Install 775 feet of cathodic protection/ground bed.
Ground Bed 10	Brunswick County, VA	269.9	Install 800 feet of cathodic protection/ground bed.
Ground Bed 11	Greensville County, VA	290.5	Install 860 feet of cathodic protection/ground bed.
AP-2 Mainline			
Ground Bed 12	Halifax County, NC	16.3	Install 940 feet of cathodic protection/ground bed.
Ground Bed 13	Nash County, NC	36.8	Install 900 feet of cathodic protection/ground bed.
Ground Bed 14	Nash County, NC	60.4	Install 890 feet of cathodic protection/ground bed.
Ground Bed 15	Johnston County, NC	79.3	Install 1,010 feet of cathodic protection/ground bed.
Ground Bed 16	Johnston County, NC	84.6	Install 790 feet of cathodic protection/ground bed.
Ground Bed 17	Johnston County, NC	99.9	Install 780 feet of cathodic protection/ground bed.
Ground Bed 18	Robeson County, NC	161.5	Install 930 feet of cathodic protection/ground bed.
Ground Bed 19	Robeson County, NC	172.4	Install 1,010 feet of cathodic protection/ground bed.
AP-3 Lateral			
Ground Bed 20	Southampton County, VA	24.2	Install 670 feet of cathodic protection/ground bed.
Supply Header Project			
TL-636 Loopline			
Ground Bed 21	Westmoreland County, PA	1.4	Install 640 feet of cathodic protection/ground bed.
TL-635 Loopline			
Ground Bed 22	Doddridge County, WV	4.6	Install 535 feet of cathodic protection/ground bed.
Ground Bed 23	Doddridge County, WV	17.8	Install 540 feet of cathodic protection/ground bed.
Ground Bed 24	Wetzel County, WV	29.5	Install 580 feet of cathodic protection/ground bed.

[a] There are no cathodic protection/ground beds along the AP-4 and AP-5 laterals.

Note: No cathodic protection facilities would be located on NFS lands.

TABLE 2.1.2-6

Communication Towers for the Atlantic Coast Pipeline

Pipeline Segment/Facility	County/City, State/ Commonwealth	Milepost	Scope of Work
AP-1 Mainline			
Wilsonburg	Harrison County, WV	NA	Located 13.6 miles northeast of AP-1 MP 0.0. Install new microwave antennas on existing tower.
Compressor Station 1	Lewis County, WV	7.6	Construct new tower and shelter within Compressor Station 1 workspace.
Long Run M&R Station [a]	Randolph County, WV	47.3	Construct new tower.
Sounding Knob [a]	Highland County, VA	NA	Located 9.1 miles northeast of AP-1 MP 89. Install new microwave antennas and shelter.
Bath County Power Station [b]	Bath County, VA	NA	Located 5.2 miles southwest of AP-1 MP 89. Construct new megawatt antennas.
Rocky Mountain MW Site [b]	Rockbridge County, VA	NA	Located 13 miles southeast of AP-1 MP 159. Construct new antennas on existing tower.
Compressor Station 2	Buckingham County, VA	191.5	Construct new tower and shelter.
Bremo Repeater MW Site	Fluvanna County, VA	NA	Located 22.3 miles east-northeast of CS2. Replace existing tower and install new microwave antennas.
Farmville District Office	Prince Edward County, VA	NA	Located 6.5 miles west of AP-1 MP 224. Install new microwave antennas on existing tower.
ACP Valve Site #18	Prince Edward County, VA	225.7	Construct new tower, shelter, generator, gas tank.
ACP Valve Site #19	Nottoway County, VA	245.2	Construct new tower, shelter, generator, gas tank.
Rawlings Substation	Brunswick County, VA	NA	Located 0.5 mile east-northeast of MP AP-1 267. Install new microwave antennas on existing tower.
Compressor Station 3	Northampton County, NC	300.2	Construct new tower and shelter.
AP-2 Mainline			
Cox Substation	Halifax County, NC	NA	3.75 miles west of AP-2 MP 30. Construct new tower.
Smithfield M&R Station	Johnston County, NC	92.7	Construct new tower.
Erwin MW Site	Harnett County, NC	NA	Located 7 miles northwest of AP-2 MP 116. Replace existing tower and construct new antennas, shelter, generator, natural gas tank.
Fayetteville M&R Station	Cumberland County, NC	132.9	Construct new tower.
Cumberland MW Site	Cumberland County, NC	NA	Located 0.5 mile east of AP-2 MP 153.0. Replace existing tower and construct new antennas, shelter, generator, natural gas tank.
Pembroke M&R Station	Robeson County, NC	182.9	Construct new tower.
AP-3 Lateral			
Boykins Substation	Southampton County, VA	NA	Located 0.3 mile northwest of AP-3 MP 20. Construct new tower and shelter.
Southampton Substation	Southampton County, VA	NA	Located 1.6 miles north of AP-3 MP 32. Construct new tower and shelter.
Holland Substation	Suffolk, VA	NA	Located 0.5 mile west of AP-3 MP 48. Construct new tower and shelter.
Suffolk Substation	Suffolk, VA	NA	Located 6 miles south of AP-3 MP 64. Construct new antennas and shelter.
Elizabeth River Repeater MW Site	City of Chesapeake, VA	NA	Located 0.3 mile northeast of AP-3 MP 81. Install new antennas on existing tower.
Elizabeth River M&R Station	City of Chesapeake, VA	82.7	Construct new tower.
AP-5 Lateral			
Greensville M&R Station	Greensville County, VA	1.0	Construct new tower.

[a] Atlantic is evaluating the option to collocate new equipment on two existing structures located between Long Run M&R and Sounding Knob. Options are being evaluated; however, an exact location has not been finalized.

[b] Located within an existing authorized facility on NFS lands. No additional authorization would be required from the FS.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land requirements for ACP and SHP; table 2.2-2 summarizes the land requirements for the portion of ACP on NFS lands. A more detailed discussion of land use impacts for ACP and SHP is provided in section 4.8; a more detailed discussion of land use impacts for the portion of ACP on federal lands is provided in section 4.8.9.

Collectively, construction of ACP and SHP would disturb 11,775.9 acres of land. Following construction, 4,929.6 acres of new land would be maintained for operation and maintenance of the project facilities. The remaining 6,846.3 acres of land disturbed by ACP and SHP would be restored and allowed to revert to former use. The portion of ACP on NFS lands would disturb 430.4 acres of land, including the pipeline construction right-of-way, additional temporary workspaces (ATWS), and access roads. Following construction, 214.0 acres of new land would be maintained for operation and maintenance of the project facilities on NFS lands, based on a typical 50-foot-wide operational right-of-way and access roads. The remaining 216.4 acres of land disturbed by ACP on NFS lands would be restored and allowed to revert to former use.

2.2.1 Pipeline Right-of-way

2.2.1.1 Atlantic Coast Pipeline

Atlantic would use a variety of right-of-way configurations to construct and operate the pipeline facilities as presented in table 2.2.1-1. The width of the construction rights-of-way would be reduced to 75 feet in wetland areas where feasible and through other sensitive areas such as waterbodies, sensitive biological areas, and residential lands, as necessary.

For the AP-1 mainline, the construction right-of-way in non-agricultural uplands would measure 125 feet in width, with a 40-foot-wide spoil side and an 85-foot-wide working side. In areas where full width topsoil segregation is required (e.g., agricultural areas), an additional 25 feet of temporary construction workspace would be needed on the working side of the corridor to provide sufficient space to store topsoil.

In West Virginia and northwestern Virginia, the proposed AP-1 mainline would be constructed in steep terrain. Generally, the pipeline alignment runs along ridgelines and up and down slopes (as opposed to crossing laterally on side slopes). Installation along the ridgelines would generally require a wider construction rights-of-way to create a level work area and store trench material. When constructing along steep slopes, construction personnel would be required to work in the trench to weld the pipeline. In these areas, the trench would typically be 30 feet wide to provide sufficient space for construction personnel to work in the trench safely. The additional spoil generated from a wider trench would require an additional 25 feet of temporary construction workspace to provide sufficient space to store trench spoil. For these reasons, Atlantic would require a wider construction right-of-way for the AP-1 mainline as identified in table 2.2.1-1.

TABLE 2.2-1

Land Requirements of the Atlantic Coast Pipeline and Supply Header Project

Project/Component	Total Construction (acres)	Total Operation (acres)
Atlantic Coast Pipeline		
Pipeline Right-of-Way		
AP-1	4,879.2	1,991.2
AP-2	2,263.5	1,127.8
AP-3	779.2	505.8
AP-4	3.9	2.4
AP-5	8.5	5.7
Additional Temporary Workspace [a]		
AP-1	637.0	0.0
AP-2	337.8	0.0
AP-3	102.9	0.0
AP-4	0.2	0.0
AP-5	1.7	0.0
Cathodic Protection/Ground Beds	8.4	3.8
Aboveground Facilities		
Compressor Stations		
Compressor Station 1	71.2	44.9
Compressor Station 2	50.2	12.9
Compressor Station 3	44.9	30.0
Metering and Regulating Stations		
Kincheloe M&R Station [b]	0.0	0.0
Long Run M&R Station	2.7	2.7
Woods Corner M&R Station [b]	0.0	0.0
Smithfield M&R Station	5.6	5.5
Fayetteville M&R Station	6.8	6.8
Pembroke M&R Station	2.5	2.5
Elizabeth River M&R Station	1.0	0.9
Brunswick M&R Station	1.4	1.4
Greensville M&R Station	1.4	1.4
Valves [c]	0.0	0.0
Pig Launchers/Receivers [d]	3.0	3.0
Access Roads		
Existing Roads	818.4	760.6
New To-Be-Constructed Roads	43.5	30.4
Hybrid [e]	35.7	35.7
Pipe/Contractor Yards [f]		
Contractor Yard Spread 01-A	43.5	0.0
Contractor Yard Spread 02-A	38.3	0.0
Contractor Yard – GWNF – 6 Spread 02A-A	38.1	0.0
Contractor Yard – GWNF – 6 Spread 02A-B	77.5	0.0
Pipe Yard 01-A	9.8	0.0
Contractor Yard – GWNF – 6 Spread 02-D	34.4	0.0
Contractor Yard – GWNF – 6 Spread 03-A	20.5	0.0
Contractor Yard – GWNF – 6 Spread 03-B	65.1	0.0
Pipe Yard 04-A	2.4	0.0
Pipe Yard 04-C	7.7	0.0
Pipe Yard 06-A	1.5	0.0
Contractor Yard Spread 03-A	31.9	0.0

TABLE 2.2-1 (cont'd)		
Land Requirements of the Atlantic Coast Pipeline and Supply Header Project		
Project/Component	Total Construction (acres)	Total Operation (acres)
Contractor Yard Spread 04-A	36.4	0.0
Contractor Yard Spread 04-A-A	58.6	0.0
Contractor Yard – GWNF – 6 Spread 03A-A	44.9	0.0
Contractor Yard – GWNF – 6 Spread 03A-B	50.7	0.0
Contractor Yard Spread 05-C	40.8	0.0
Contractor Yard – GWNF – 6 Spread 04-A	43.8	0.0
Contractor Yard Spread 06-C	36.5	0.0
Contractor Yard Spread 07-B	30.1	0.0
Contractor Yard Spread 08-A	45.6	0.0
Contractor Yard Spread 09-A	41.7	0.0
Contractor Yard Spread 10-A	40.2	0.0
Contractor Yard Spread 11-C	17.8	0.0
Communication Towers	1.1	1.1
Atlantic Coast Pipeline Subtotal	10,970.8	4,577.3
Supply Header Project		
Pipeline Right-of-Way		
TL-636	45.0	23.3
TL-635	392.6	197.2
Additional Temporary Workspace [a]		
TL-636	9.7	0.0
TL-635	71.4	0.0
Cathodic Protection/Ground Beds	2.5	2.5
Aboveground Facilities		
Compressor Station Modifications		
JB Tonkin Compressor Station	13.6	3.1
Crayne Compressor Station	12.6	0.0
Burch Ridge Compressor Station	6.4	0.0
Mockingbird Hill Compressor Station	64.0	9.5
Metering and Regulating Stations		
CNX M&R Station [b]	0.0	0.0
Valves [c]	0.0	0.0
Pig Launchers/Receivers		
JB Tonkin Compressor Station [d]	0.0	0.0
Valero Gate Junction	0.6	0.6
Mockingbird Hill Compressor Station [d]	0.0	0.0
Marts Junction	0.6	0.6
Access Roads		
Existing Roads	79.5	79.5
New To-Be-Constructed Roads	11.1	11.1
Hybrid [e]	25.0	25.0
Pipe/Contractor Yards		
Contractor Yard 1	1.3	0.0
Contractor Yard 2	3.3	0.0
Contractor Yard 3	0.8	0.0
Contractor Yard 4	1.6	0.0
Contractor Yard 5	1.0	0.0
Contractor Yard 6	1.2	0.0
Contractor Yard 7	0.7	0.0
Contractor Yard 8	1.7	0.0

TABLE 2.2-1 (cont'd)

Land Requirements of the Atlantic Coast Pipeline and Supply Header Project

Project/Component	Total Construction (acres)	Total Operation (acres)
Contractor Yard 9	2.8	0.0
Contractor Yard 10	22.5	0.0
Contractor Yard 11	33.6	0.0
Communication Towers	0.0	0.0
Supply Header Project Subtotal	805.2	352.6
Atlantic Coast Pipeline and Supply Header Project Total	11,775.9	4,929.6

[a] Includes additional temporary workspace, topsoil segregation areas, and water impoundment structures locations.

[b] These facilities would be installed within the same construction or operational footprint as the Compressor Stations 1, 2, or 3; the Smithfield, Pembroke, Elizabeth River, Brunswick, and Greensville M&R Stations; or the Burch Ridge, JB Tonkin, or Mockingbird Hill Compressor Stations; therefore, no additional land would be affected by construction or operation of these facilities.

[c] Includes valves that would not be built within the permanent easement for the pipelines.

[d] No additional land would be affected by construction or operation of the pig launcher/receiver assemblies installed on the same sites and within the same fence lines as Compressors Stations 2 and 3 and the Smithfield, Pembroke, Elizabeth River, Brunswick, and Greensville M&R Stations.

[e] Includes access roads where a portion of the road is existing and a portion is new, to-be-constructed.

[f] Construction spreads are identified in table 2.4-1.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

TABLE 2.2-2

Land Requirements of the Atlantic Coast Pipeline on National Forest System Lands

	Total (acres)	
National Forest/Facility/Component	Construction	Operation
Monongahela National Forest		
AP-1 Mainline Right-of-Way	77.9	30.9
Additional Temporary Workspace [a]	7.9	0.0
Access Roads		
Existing/Hybrid Roads [b]	24.9	24.8
New To-Be-Constructed Roads	0.1	0.1
Pipe/Contractor Yards		
Pipe Yard 06-A	1.5	0.0
Monongahela National Forest Subtotal	112.3	55.8
George Washington National Forest		
AP-1 Mainline Right-of-Way	235.0	94.7
Additional Temporary Workspace [a]	16.4	0.0
Access Roads		
Existing Roads	65.3	62.1
New To-Be-Constructed Roads	1.5	1.5
George Washington National Forest Subtotal	318.1	158.2
National Forest System Lands Total	430.4	214.0

[a] Includes additional temporary workspace, topsoil segregation areas, and water impoundment structure locations.

[b] Includes two access roads where a portion of the road is existing and a portion is new, to-be-constructed.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

TABLE 2.2.1-1 **Typical Construction and Operational Right-of-Way Configurations for the Atlantic Coast Pipeline**				
Pipeline Facility	Total Construction Width (feet) [a]	Spoil Side Width (feet)	Working Side Width (feet)	Operation Width (feet)
AP-1 Mainline				
Non-Agricultural Areas	125	40	85	50
Agricultural Areas	150	40	110	50
AP-2 Mainline				
Non-Agricultural Areas	110	35	75	50
Agricultural Areas	135	35	100	50
AP-3, AP-4, and AP-5 Laterals				
Non-Agricultural Areas	75	25	50	50
Agricultural Areas	100	25	75	50

[a] The construction right-of-way would be reduced to 75 feet wide in wetland areas except where modifications are requested and deemed acceptable (see table 2.3.1-3).

Atlantic is pursuing negotiations for a 75-foot-wide permanent right-of-way easement for the AP-1 mainline, but has stated it would only maintain a 50-foot-wide permanent right-of-way during operation. Where the AP-1 mainline is located on NFS lands, the right-of-way width would be reduced to 50 feet. Although Atlantic can pursue negotiations with landowners for a larger right-of-way, we do not concur that Atlantic's proposed 75-foot-wide permanent right-of-way is necessary to operate the AP-1 mainline. Based on our experience and review of similar projects, as well as our understanding of pipeline operations and maintenance procedures, we believe that a 50-foot-wide permanent right-of-way is sufficient to safely and efficiently operate large diameter natural gas pipelines. For these reasons, **we recommend that**:

- **Atlantic should not exercise eminent domain authority granted under section 7(h) of the NGA to acquire a permanent pipeline right-of-way exceeding 50 feet in width. In addition, where Atlantic has obtained a larger permanent right-of-way width through landowner negotiations, routine vegetation mowing and clearing over the permanent right-of-way should not exceed 50 feet in width.**

For the AP-2 mainline, the construction corridor in non-agricultural uplands would measure 110 feet in width, with a 35-foot-wide spoil side and a 75-foot-wide working side. In areas where full width topsoil segregation is required (e.g., agricultural areas), an additional 25 feet of temporary construction workspace would be needed on the working side of the corridor to provide sufficient space to store topsoil. In wetlands, the width of the construction right-of-way would be reduced to 75 feet, with 25 feet on the spoil side and 50 feet on the working side.

Additional detail on land use impacts are provided in section 4.8. Typical drawings of Atlantic's temporary construction and permanent rights-of-way are provided in appendix C.

2.2.1.2 Supply Header Project

Construction of the TL-636 and TL-635 looplines would generally require a 100-foot-wide construction right-of-way to permit the safe passage of equipment and materials associated with construction of the 30-inch-diameter loop pipelines. The construction right-of-way in non-agricultural upland areas that are collocated with existing rights-of-way would measure 100 feet wide, with a 25-foot-wide spoil side and a 75-foot-wide working side. The construction right-of-way in non-agricultural upland areas that are not collocated with existing rights-of-way would measure 110 feet wide, with a 35-foot-wide spoil side and a 75-foot-wide working side. In areas where full width topsoil segregation is required, an additional 25 feet of temporary construction workspace would be needed on the working side of the right-of-way to provide sufficient space to store topsoil. In wetlands, the width of the construction right-of-way would be reduced to 75 feet, with 25 feet on the spoil side and 50 feet on the working side. Following construction, a 50-foot-wide permanent easement would be maintained for operation of the pipeline loops. Typical drawings of DETI's temporary construction and permanent rights-of-way are provided in appendix C.

2.2.2 Collocation with Existing Rights-of-Way

The use, enlargement, or extension of existing rights-of-way over developing a new right-of-way is a means to potentially reduce impacts on resources (often called "collocation"). For linear, utility-type facilities, collocation of a new easement can involve: a) abutting an existing easement, b) partially overlapping or sharing land within an existing easement, or c) siting a facility wholly within an existing easement. Given technical construction and operational constraints, the first two scenarios are far more common. In general, the collocation of new pipeline along existing rights-of-way or other linear corridors that have been previously cleared or used (such as pipelines, power lines, roads, or railroads) may be environmentally preferable to the development of new rights-of-way. Construction-related impacts and adverse cumulative impacts can normally be reduced by use of previously cleared or disturbed rights-of-way; however, in congested or environmentally sensitive areas, it may be advantageous to deviate from an existing right-of-way. Additionally, collocation may be infeasible in some areas due to a lack of or unsuitably oriented existing corridors, engineering and design considerations, or constructability or permitting issues. Combined, ACP and SHP would be collocated along about 14 percent of the pipelines and loops. Additional details regarding collocation of ACP and SHP are provided below.

2.2.2.1 Atlantic Coast Pipeline

Atlantic's proposed mainline pipelines (AP-1 and AP-2) would be collocated with existing rights-of-way for 48 miles or 9 percent of the combined lengths of these pipelines. None of the proposed AP-1 mainline on NFS lands would be collocated with existing rights-of-way. The proposed AP-3 lateral would be collocated with existing rights-of-way for 29 miles or 35 percent of the total length of the AP-3 route. No section of the AP-4 and AP-5 laterals would be collocated with existing facilities. A total of 13 percent of the combined ACP routes would be collocated with existing facilities. The locations where ACP's construction and operational rights-of-way would be collocated within existing rights-of-way is presented in table 2.2.2-1.

2.2.2.2 Supply Header Project

The TL-636 and TL-635 pipeline loops would be collocated with rights-of-way for 3.9 and 7.6 miles (100 percent and 23 percent), respectively. A total of 31 percent of the combined SHP routes would be collocated with existing facilities. The locations where SHP's construction and operational rights-of-way would be collocated within existing rights-of-way are presented in table 2.2.2-1.

2.2.3 Additional Temporary Workspace

In addition to the construction workspaces identified above, ATWS would typically be required in the following areas:

- adjacent to crossings of roadways, railroads, waterbodies, wetlands, or other utilities;
- construction constraint areas that require special construction techniques, such as HDD entry and exit locations;
- HDD pipe fabrication areas;
- areas requiring extra trench depth or spoil storage areas;
- certain pipe bend locations;
- locations with soil stability concerns or side slope construction;
- truck turnarounds or equipment passing lanes; and
- hydrostatic test water withdrawal and discharge locations and water impoundment structures.

2.2.3.1 Atlantic Coast Pipeline

Most ATWS for the project would add 25 feet to the width of construction right-of-way. In total, ATWS for ACP would disturb 1,079.6 acres of land during construction. Appendix D identifies where Atlantic has requested extra workspace for staging areas, water impoundment structures, and resource crossings, including workspace dimensions, the acreage of impact, associated land use, and the justification for their use. A detailed discussion of Atlantic's requests for extra workspace is provided in sections 2.3, 4.3.2.7, and 4.3.3.7.

ATWS associated with the AP-1 mainline on NFS lands would disturb 24.3 acres during construction. ATWS located on NFS lands are identified in appendix D.

2.2.3.2 Supply Header Project

In total, ATWS for SHP would temporarily disturb 81.1 acres of land. Appendix D identifies where DETI has requested extra workspace, including workspace dimensions, the acreage of impact, and the justification for their use. Further discussion of DETI's requests for extra workspace is provided in sections 2.3, 4.3.2.7, and 4.3.3.7.

TABLE 2.2.2-1

Existing Rights-of-Way Overlapped by the Atlantic Coast Pipeline and Supply Header Project

Facility, County/City, State/Commonwealth	Begin Milepost	End Milepost	Length (miles)	Construction (acres)	Operational (acres)	Type of ROW	Ownership or Use
Atlantic Coast Pipeline [a]							
AP-1 Mainline							
Harrison, WV	0.0	0.2	0.2	2.4	0.9	Natural Gas	DETI
Lewis, WV	6.0	6.3	0.3	4.5	1.8	Natural Gas	EQT Midstream Partners (Equitrans)
Lewis, WV	7.1	7.3	0.2	3.4	1.2	Natural Gas	DETI
Lewis, WV	8.9	9.2	0.3	5.2	1.9	Natural Gas	DETI
Upshur, WV	27.0	27.1	0.2	3.4	1.1	Electric Transmission	Monongahela Power Company
Randolph, WV	44.8	44.9	0.2	2.3	0.9	Road	Unknown
Randolph, WV	47.5	47.9	0.4	6.1	2.4	Road	County Road 42/1
Randolph, WV	48.2	48.5	0.4	5.5	2.2	Road	County Road 42/1
Randolph, WV	48.9	49.8	1.3	20.4	11.5	Road	County Road 46/2
Randolph, WV	50.1	50.3	0.2	3.7	1.2	Other	Former Strip Mine
Randolph, WV	56.0	56.1	0.3	4.2	1.5	Other	Former Strip Mine
Randolph, WV	56.3	56.6	0.5	9.4	3.0	Other	Former Strip Mine
Randolph, WV	62.0	63.0	1.2	21.8	7.3	Other	Former Strip Mine
Randolph, WV	63.3	63.6	0.4	6.2	2.3	Other	Former Strip Mine
Pocahontas, WV	75.6	75.7	0.2	3.1	1.2	Road	County Highway 9
Pocahontas, WV	76.1	76.2	0.3	3.3	1.6	Road	County Highway 9
Augusta, VA	146.5	146.8	0.4	6.8	2.2	Road	Wayne Avenue
Augusta, VA	149.4	149.6	0.2	3.2	1.0	Road	Schages Lane
Augusta, VA	157.1	157.3	0.2	2.5	1.0	Road	Mt. Torrey
Buckingham, VA	191.4	191.6	0.2	6.9	3.0	Natural Gas	Transco
Brunswick, VA	260.9	261.2	0.3	4.3	1.7	Road	Gills Bridge Road
Brunswick, VA	267.1	279.4	12.5	193.0	74.2	Electric Transmission	Brunswick
Greensville, VA	288.8	292.1	3.3	54.1	19.9	Natural Gas	Columbia Gas Transmission, LLC
	AP-1 Mainline Total		23.4	375.9	141.6		
AP-2 Mainline							
Northampton, NC	4.3	4.9	0.6	10.1	3.8	Electric Transmission	Dominion Virginia Power (DVP)
Johnston, NC	104.7	104.9	0.3	4.4	1.7	Road	New Hope Road
Cumberland, NC	129.4	129.5	0.1	1.2	0.5	Railroad	South End Subdivision
Cumberland, NC	130.7	131.0	0.2	3.0	1.4	Natural Gas	Piedmont
Cumberland, NC	132.2	132.8	0.6	9.5	3.9	Natural Gas	Piedmont
Cumberland, NC	136.7	138.4	1.8	17.3	11.0	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	138.6	140.6	2.1	24.2	12.9	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	140.7	142.1	1.6	15.6	9.5	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	142.3	152.3	10.7	137.5	65.1	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	152.7	154.3	1.4	20.2	8.6	Electric Transmission	Progress Energy Carolinas, LLC

TABLE 2.2.2-1 (cont'd)

Existing Rights-of-Way Overlapped by the Atlantic Coast Pipeline and Supply Header Project

Facility, County/City, State/Commonwealth	Begin Milepost	End Milepost	Length (miles)	Construction (acres)	Operational (acres)	Type of ROW	Ownership or Use
Cumberland, NC	154.6	155.8	1.3	16.8	7.8	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	155.9	157.3	1.5	19.5	9.2	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	157.4	157.4	0.1	0.7	0.4	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	157.6	159.0	1.4	19.2	8.5	Electric Transmission	Progress Energy Carolinas, LLC
Cumberland, NC	159.2	159.7	0.5	6.4	2.8	Electric Transmission	Progress Energy Carolinas, LLC
Robeson, NC	163.0	163.2	0.2	3.4	1.3	Electric Transmission	Progress Energy Carolinas, LLC
	AP-2 Mainline Total		24.4	305.6	148.0		
AP-3 Lateral							
Northampton, NC	6.2	9.5	3.3	34.6	20.3	Electric Transmission	DVP
Northampton, NC	12.0	13.2	1.2	10.9	7.3	Road	Highway 186
Southampton, VA	14.1	15.9	1.9	17.7	11.3	Electric Transmission	DVP
Southampton, VA	16.1	16.4	0.4	3.3	2.2	Electric Transmission	DVP
Southampton, VA	16.7	22.4	5.7	59.7	34.3	Electric Transmission	DVP
Southampton, VA	25.6	27.0	1.5	17.4	9.0	Electric Transmission	DVP
Southampton, VA	27.3	28.6	1.2	11.8	7.3	Electric Transmission	DVP
Southampton, VA	30.9	31.3	0.4	4.4	2.2	Road	Greenfield
City of Suffolk, VA	43.3	44.4	1.1	11.0	6.6	Electric Transmission	DVP
City of Suffolk, VA	45.6	45.7	0.2	1.5	0.9	Electric Transmission	DVP
City of Suffolk, VA	47.9	48.3	0.4	4.9	2.5	Electric Transmission	DVP
City of Suffolk, VA	49.0	49.3	0.3	3.8	2.0	Electric Transmission	DVP
City of Suffolk, VA	62.3	62.7	0.4	4.5	2.4	Natural Gas	Columbia Gas Transmission, LLC
City of Suffolk, VA	65.0	65.1	0.1	2.3	0.7	Electric Transmission	DVP
City of Suffolk, VA	65.4	68.8	3.5	30.9	19.2	Electric Transmission	DVP
City of Suffolk, VA	71.2	71.4	0.2	1.8	1.2	Road	West Military Highway
City of Chesapeake, VA	71.8	72.5	0.8	7.1	4.7	Electric Transmission	Dominion
City of Chesapeake, VA	72.6	73.1	0.5	4.8	3.2	Natural Gas	Columbia Gas Transmission, LLC
City of Chesapeake, VA	74.5	76.1	1.6	14.6	9.8	Railroad	Norfolk Southern Railway
City of Chesapeake, VA	76.5	77.2	0.7	5.0	4.4	Railroad	Norfolk Southern Railway
City of Chesapeake, VA	77.5	77.9	0.4	2.6	2.2	Electric Transmission	DVP
City of Chesapeake, VA	78.3	81.1	2.8	25.5	16.9	Electric Transmission	Unknown

TABLE 2.2.2-1 (cont'd)

Existing Rights-of-Way Overlapped by the Atlantic Coast Pipeline and Supply Header Project

Facility, County/City, State/Commonwealth	Begin Milepost	End Milepost	Length (miles)	Construction (acres)	Operational (acres)	Type of ROW	Ownership or Use
Cumberland, NC	154.6	155.8	1.3	16.8	7.8	Electric Transmission	Progress Energy Carolinas, LLC
City of Chesapeake, VA	81.2	81.7	0.5	5.6	3.0	Railroad	Norfolk Southern Railway
City of Chesapeake, VA	82.3	82.4	0.1	1.5	0.9	Road	Smith Douglas Road
AP-3 Lateral Total			28.7	285.5	173.4		
Atlantic Coast Pipeline Subtotal			76.5	967.0	463.0		
Supply Header Project							
TL-636 Loopline							
Westmoreland, PA	0.0	3.9	3.9	55.2	24.4	Natural Gas	Peoples Natural Gas
TL-636 Loopline Total			3.9	55.2	24.4		
TL-635 Loopline							
Harrison, WV	0.0	0.7	0.6	8.3	4.0	Natural Gas	DETI
Doddridge, WV	0.7	1.3	0.6	7.1	3.5	Natural Gas	DETI
Doddridge, WV	7.4	7.7	0.3	4.4	1.7	Natural Gas	Columbia Gas Transmission, LLC
Doddridge, WV	12.0	12.3	0.2	3.9	1.3	Natural Gas	Mountaineer Midstream Company, LLC
Doddridge, WV	13.5	17.5	4.0	63.2	24.0	Natural Gas	DETI
Doddridge, WV	18.0	18.4	0.5	6.3	2.8	Natural Gas	DETI
Doddridge, WV	21.4	21.9	0.5	7.5	3.3	Natural Gas	DETI
Doddridge, WV	22.5	22.8	0.3	4.1	1.9	Natural Gas	DETI
Tyler, WV	22.8	22.9	0.1	1.0	0.4	Natural Gas	DETI
Wetzel, WV	32.5	33.1	0.5	7.4	3.3	Natural Gas	Equitrans
TL-635 Loopline Total			7.6	113.2	46.2		
Supply Header Project Subtotal			11.5	168.4	70.6		
Total			88.0	1,135.4	533.6		

[a] No existing rights-of-way would be paralleled on NFS lands or along the AP-4 and AP-5 Laterals.

2.2.4 Pipe/Contractor Yards and Staging Areas

2.2.4.1 Atlantic Coast Pipeline

To support construction activities, Atlantic proposes to use 24 contractor yards during construction. The contractor yards range in size from 1.5 acres to 77.5 acres and would be used for equipment, pipe sections, and construction material and supply storage, as well as temporary field offices, parking, and pipe preparation and preassembly staging areas. The use of these sites would temporarily disturb 857.8 acres of land. The contractor yards would be restored in accordance with Atlantic's and DETI's construction plans (see section 2.3) or as requested by the landowner or land management agency. One pipe/contractor yard (1.5 acres) would be located on NFS lands on the MNF. Yard locations are depicted on the topographic maps in appendix B.

2.2.4.2 Supply Header Project

To support construction activities for SHP, DETI proposes to use 11 contractor yards during construction. The contractor yards range in size from 0.7 acre to 33.6 acres and would be used for equipment, pipe sections, and construction material and supply storage, as well as temporary field offices, parking, and pipe preparation and preassembly staging areas. The use of these sites would temporarily disturb 70.5 acres of land. The contractor yards would be restored to their former land use after construction is complete, or allowed to revert to their former land use if tree clearing is required. Yard locations are depicted on the topographic maps in appendix B.

2.2.5 Access Roads

2.2.5.1 Atlantic Coast Pipeline

Atlantic and DETI would use existing public and private roads to gain access to the pipeline rights-of-way and aboveground facilities to the fullest extent possible, and would also construct and use new access roads where access is needed and roads do not currently exist. Many of the proposed access roads are existing roads that can accommodate construction traffic without modification or improvement. Some access roads, however, are dirt or gravel roads that are not currently suitable for construction traffic. Where necessary, Atlantic and DETI would improve unsuitable dirt and gravel roads through widening and/or grading, gravelling, installing or replacing culverts, or clearing overhanging vegetation or tree limbs. Widening would generally involve increasing the width of the road up to 25 feet. After construction, Atlantic and DETI would remove access road improvements and restore improved roads to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place, or the roads would be utilized as operational access to the pipeline right-of-way or aboveground facilities.

Atlantic has identified 369 existing roads that would need to be temporarily improved for ACP. Atlantic would also construct 64 new access roads during construction of ACP, and 18 proposed access roads consist of an existing road that would also include a new portion that would need to be constructed. A total of 419 permanent roads would be required for operation of ACP and maintained for the life of the project.

A total of 17 access roads would be used during construction of ACP on NFS lands. Twelve of these are existing roads that would need to be temporarily improved for ACP; two of which would also require short segments of new road construction to access the pipeline corridor. Atlantic would construct the remaining five new access roads during project construction. A total of 16 long-term roads would be required for operation of ACP on NFS lands. A Road Use permit may be required for commercial hauling on existing roads open to the public and under the FS' jurisdiction, often known as NFS roads. Such additional permitting would be issued on an individual basis per road if required by weight, size, or legal travel regulations.

Table 2.2-1 summarizes the acres that would be required for access roads for ACP. Access roads are depicted on the project location maps provided in appendix B. The location, description, length, land use, and type of improvement required for each access road are listed in appendix E.

2.2.5.2 Supply Header Project

DETI has identified 46 existing roads that would need to be temporarily improved for SHP. DETI would also construct 17 new access roads during construction of SHP, and 12 proposed access roads consist of an existing road that would also include a new portion that would need to be constructed. A total of 75 permanent roads would be required for operation of SHP and maintained for the life of the project. Table 2.2-1 summarizes the acres that would be required for access roads for SHP. The location, description, length, land use, and type of improvement required for each access road are listed in appendix E.

2.2.6 Aboveground Facilities

2.2.6.1 Atlantic Coast Pipeline

Construction and operation of the aboveground facilities for ACP would temporarily disturb 190.7 acres of land and permanently affect 112.0 acres of land; no aboveground facilities would be located on NFS lands. Table 2.2-1 lists the land required for each aboveground facility. Valves would be installed within the operational pipeline rights-of-way. All pig launchers and receivers would be installed within the 50-foot-wide operational pipeline right-of-way; or within the compressor station, M&R station facilities, or valve sites, except for the launcher/receiver proposed at AP-1 MP 105.6, which would extend outside the operational right-of-way.

2.2.6.2 Supply Header Project

Constructing, modifying, and operating the aboveground facilities for SHP would temporarily disturb about 97.8 acres of land and permanently affect 13.7 acres of land. Table 2.2-1 lists the land required for each aboveground facility. Modifications to the compressor stations would take place within or adjacent to the existing fenced compressor station facilities. The proposed CNX M&R Station would be constructed within the same fenceline of the proposed Compressor Station 1 for ACP. Valves would be installed within the proposed operational pipeline rights-of-way. Pig launcher and receiver facilities would be installed within the fenceline of aboveground facility sites.

2.3 CONSTRUCTION PROCEDURES

Atlantic and DETI would design, construct, operate, and maintain their respective pipelines and facilities in accordance with DOT regulations under 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) and other applicable federal and state/ commonwealth regulations. DOT regulations specify pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel, in addition to other design standards. Atlantic and DETI would also comply with the siting and maintenance requirements under 18 CFR 380.15 (Siting and Maintenance Requirements) and other applicable federal and state/commonwealth regulations, including the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). These safety regulations are intended to ensure adequate protection of the public, pipeline workers, contractors, and employees and to prevent natural gas pipeline accidents and failures (see section 4.12).

2.3.1 Mitigation

Various forms of mitigation are defined by the CEQ in 40 CFR 1508.20, including:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

- compensating for the impact by replacing or providing substitute resources or environments.

Section 4 of this EIS describes the resource-specific measures that Atlantic and DETI have proposed to minimize environmental impacts, and includes our additional recommended mitigation measures as well as those recommended or that may be required by other agencies. General approaches to mitigation applicable to ACP and SHP are presented below.

2.3.1.1 General Federal Energy Regulatory Commission Mitigation Measures

Atlantic and DETI agreed to adopt the FERC's general construction, restoration, and operational mitigation measures outlined in our *Upland Erosion Control, Revegetation, and Maintenance Plan* (FERC *Plan*) and our *Wetland and Waterbody Construction and Mitigation Procedures* (FERC *Procedures*).[4] In their applications and supplemental filings, Atlantic and DETI also provided a series of construction plans describing how they would construct and operate their respective projects; reduce potential environmental impacts; and restore, monitor, and maintain the construction and operational right-of-way. These plans are identified in table 2.3.1-1 below and are discussed in more detail throughout the EIS.

Atlantic's and DETI's construction plans include modification to our *Procedures* regarding the use of certain extra workspaces within or adjacent to waterbodies or wetlands. These modifications are presented in tables 2.3.1-2 and 2.3.1-3 below, and include Atlantic's and DETI's justification for each location. We have reviewed these specific requests and justifications and agree that they provide sufficient protection to the resource, and as such, we find these modifications acceptable. However, our review of waterbody crossings (appendix K), wetland crossings (appendix L), and Atlantic's and DETI's proposed workspaces indicate there are additional modifications to our *Procedures* that are not listed and justified in table 2.3.1-2. Therefore, **we recommend that:**

- **Atlantic and DETI should design all workspaces that are not identified in table 2.3.1-2 of the EIS to comply with the FERC *Procedures*. Any additional modifications to the FERC *Procedures* must be requested and justified in <u>Atlantic's and DETI's Implementation Plans (recommended Environmental Condition No. 6)</u>.**

On May 26, 2017, Atlantic and DETI filed additional modifications to our *Plan* and *Procedures* that are based on state erosion and sediment control standards. We have reviewed the requested modifications for each state and agree that they provide equal or greater protection as our *Plan* and *Procedures*, and as such, we find these modifications acceptable.

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[4] The FERC *Plan* and *Procedures* are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. The FERC *Plan* can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/plan.pdf. The FERC *Procedures* can be viewed on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/procedures.pdf.

TABLE 2.3.1-1 **Construction and Restoration Plans for the Atlantic Coast Pipeline and Supply Header Project**	
General Plan Name	Location of Plan
Upland Erosion Control, Revegetation, and Maintenance Plan *Wetland and Waterbody Construction and Mitigation Procedures*	The FERC *Plan* and *Procedures* can both be viewed on the FERC Internet website at https://www.ferc.gov/industries/gas/enviro/guidelines.asp.
Atlantic's and DETI's proposed modifications to FERC *Plan* and *Procedures*	FERC Accession No. 20170526-5257. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14598802
Restoration and Rehabilitation Plan	EIS Appendix F
Construction, Operation, and Maintenance Plan	EIS Appendix G
Horizontal Directional Drill Drilling Fluid Monitoring, Operations, and Contingency Plan	EIS Appendix H1
Contingency Plan for the Proposed Crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway	EIS Appendix H2
Site-Specific HDD Crossing Plans	EIS Appendix H3
Karst Terrain Assessment, Construction, Monitoring, and Mitigation Plan	EIS Appendix I
Residential Construction Plans	EIS Appendix J1
Site-Specific Crossing Plan for the James River Wildlife Management Area	EIS Appendix J2
Site-Specific Crossing Plan for the Greenbrier Rail Trail	EIS Appendix J3
Site-Specific Crossing Plan for the Allegheny Trail	EIS Appendix J4
Site-Specific Crossing Plan for the North Bend Rail Trail	EIS Appendix J5
Spill Prevention, Control, and Countermeasures Plan (SPCC Plan)	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
*Timber Removal Pla*n	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
Stormwater Pollution Prevention Plans (SHP; AP-1 [WV]; AP-2 [NC]; remaining facility plans are pending)	FERC Accession No. 20170609-5196. PDF file: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170609-5196
Contaminated Media Plan	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
Traffic and Transportation Management Plan	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
Non-Native Invasive Plant Species Management Plan	FERC Accession No. 20161115-5160. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14399112
Blasting Plan	FERC Accession No. 20161109-5138. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14395436
Slope Stability Policy and Procedure	FERC Accession No. 20170127-51202. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14475036
Winter Construction Plan	FERC Accession No. 20170127-5202. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14475037
Plans for Unanticipated Discovery of Historic Properties or Human Remains During Construction (ACP: West Virginia, Virginia, North Carolina; SHP: West Virginia, Pennsylvania)	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
*Unanticipated Discoveries Plans for Cultural Resources and Human Remains Polic*y (MNF and GWNF)	FERC Accession No. 20170512-5163. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14588372
Migratory Bird Plan	FERC Accession No. 20170505-5036. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14582932
Fire Prevention and Suppression Plan	FERC Accession No. 20170127-5202. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14475038
Open Burning Plan	FERC Accession No. 20160701-5255. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14295967
Fugitive Dust Control and Mitigation Plan	FERC Accession No. 20160718-5164. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14311323
Protected Snake Conservation Plan	FERC Accession No. 201607295-5256. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14319660
Virginia Fish Relocation Plan	FERC Accession No. 20160816-5051. PDF file: http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14330185
North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities	FERC Accession No. 20170310-5157. PDF file: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14515832

TABLE 2.3.1-2

Additional Temporary Workspace Within 50 Feet of a Wetland or Waterbody

Facility/Milepost	ATWS ID	Wetland/ Waterbody ID	ATWS Location	Justification for Modification to FERC *Procedures*
AP-1 Mainline				
9.6	ATWS-AP-1-9.628414	wleb201e	Within or adjacent to wetland	To support the bore of Wymer Road. Modification needed due to proximity of driveway to crossing location.
158.7	ATWS-AP-1-158.711407	snea020	Within or adjacent to waterbody	To support the HDD of the BRP. Modification is needed due to limited workspace adjacent to the road.
176.2	ATWS-AP-1-176.187129	snee200	Within or adjacent to waterbody	To support the bore of Laurel Road. Modification needed due to limited space between the stream and road.
176.2	ATWS-AP-1-176.188037	snee200	Within or adjacent to waterbody	To support the bore of Laurel Road. Modification needed due to limited space between the stream and road.
184.8	ATWS-AP-1-184.798701	wbuc109f	Within or adjacent to wetland	To support the HDD of the James River. Modification needed to stage materials and equipment used for the HDD.
AP-2 Mainline				
82.4	ATWS-AP-2-82.439087	wjoe001f	28 feet from wetland	To support the HDD of Little River. Modification needed to stage materials and equipment used for the HDD.
154.3	ATWS-AP-2-154.334142	wcmo022f	Within or adjacent to wetland	To support the HDD of the Cape Fear River. Modification needed to stage materials and equipment used for the HDD.
AP-3 Lateral				
9.9	ATWS-AP-3-9.892791	wnro003f	Within or adjacent to wetland	To support the bore of Hwy 186. Modification needed due to extensive wetlands on both sides of the road.
9.9	ATWS-AP-3-9.9	wnro003f	Within or adjacent to wetland	To support the bore of Hwy 186. Modification needed due to extensive wetlands on both sides of the road.
9.9	ATWS-AP-3-9.922706	wnro002f	Within or adjacent to wetland	To support the bore of railroad track and Hwy 186. Modification needed due to extensive wetlands on both sides of the road/railroad.
9.9	ATWS-AP-3-9.929936	wnro002f	Within or adjacent to wetland	To support the bore of railroad track and Hwy 186. Modification needed due to extensive wetlands on both sides of the road/railroad.
78.5	ATWS-AP-3-78.520063	wcho011e	Within or adjacent to wetland	To support the HDD of Route 17. Modification needed due to houses on the south side of the workspace.
TL-635 Loopline				
0.2	TL-635 ATWS-0.21	shag002	Within or adjacent to waterbody	To support construction across steep topography. Modification needed due to limited workspace on the eastern side of the pipeline and the location of an existing driveway.
10.6	TL-635 ATWS-10.564	sdog025	27 feet from waterbody	To support the bore of Hwy 50. Modification needed due to limited workspace adjacent to the highway.
10.6	TL-635 ATWS-10.566	sdog025	19 feet from waterbody	To support the bore of Hwy 50. Modification needed due to limited workspace adjacent to the highway.
10.6	TL-635 ATWS-10.566	wdog009e	19 feet from waterbody	To support the bore of Hwy 50. Modification needed due to limited workspace adjacent to the highway.

TABLE 2.3.1-2 (cont'd)				
Additional Temporary Workspace Within 50 Feet of a Wetland or Waterbody				
Facility/Milepost	ATWS ID	Wetland/ Waterbody ID	ATWS Location	Justification for Modification to FERC *Procedures*
10.6	TL-635 ATWS-10.617	sdog026	41 feet from waterbody	To support the bore of Hwy 50. Modification needed due to limited workspace adjacent to the highway.
18.6	TL-635 ATWS-18.638	sdog031	Within or adjacent to waterbody	To support the bore of Hwy 23. Modification needed due to limited workspace/steep topography on the northern side of the road.

TABLE 2.3.1-3			
Construction Workspaces Greater Than 75 Feet in a Wetland			
Facility/Milepost	Wetland ID	Width in Wetland (feet)	Justification for Modification to FERC *Procedures*
AP-1 Mainline			
184.8	wbuc109f	90	To support the HDD of the James River. Modification needed to stage materials and equipment used for the HDD.
AP-3 Lateral			
32.5	wsol027f	170	To support the HDD of the Nottoway River. Modification needed to stage materials and equipment used for the HDD.

2.3.1.2 General Forest Service Mitigation

The FS has a responsibility to manage the public lands for multiple uses and sustained yield. The effective use of mitigation allows the FS to support a wide variety of resources and land uses across the landscape. According to the FS, mitigation of the impacts from land uses ensures that the varied resources of the public's land continue to provide values, services, and functions for present and future generations.

Mitigation may include measures to avoid, reduce, repair, and compensate for unavoidable impacts on all NFS resource values, including but not limited to: biological, ecological, cultural, recreational, wilderness, roadless, socioeconomic, and aesthetic values. Mitigation practices for ACP would be developed and implemented to offset direct, indirect, and cumulative impacts. Mitigation may use the best science to implement landscape-scale mitigation planning, banking, in-lieu fee arrangements and other practical measures, both on-site and off-site. The FS is committed to maintaining a sustainable resource base. Additional analysis would be needed should any additional mitigation be proposed or required on NFS lands.

The FS would strive through mitigation to address adverse impacts of the proposed action on natural resources and their functions within the MNF and GWNF. This may include applying measures deemed necessary to replace or compensate for residual adverse impacts on key Forest resources. The extent to which any of the mitigation elements are used would depend on what is effective and practicable in addressing the impacts of ACP.

The SUP would incorporate mitigation measures through stipulations, terms and conditions, and other conditions of approval, as requirements of the authorization. The decision document may expressly condition approval on the project sponsor's commitment to implement all mitigation measures as described in the decision document. To guarantee implementation of the mitigation obligations, financial assurances may be required.

Atlantic has prepared a series of construction plans that would be implemented on NFS lands, which are collectively referred to as the *Construction, Operation, and Maintenance Plan* (*COM Plan*), and would be attached to and made a part of any SUP that may be issued. Atlantic has worked with the FS on developing the *COM Plan* since August 24, 2016; the latest version is included as appendix G. The construction, operation, and mitigation measures that are outlined in the *COM Plan* are described throughout this EIS, and are most notably described in section 4.8.9.1. Review of the *COM Plan* by the FS is ongoing; therefore, mitigation measures included the *COM Plan* described in this EIS could likely be modified if the FS determines additional mitigation is necessary. Atlantic and the FS are engaged in ongoing communications to develop measures to avoid and minimize impacts on NFS lands, and these communications will likely continue as the project proposal continues to be refined. Any revisions or modifications to the *COM Plan* that are not described in this EIS would be included as requirements in the SUP.

2.3.2 General Pipeline Construction Procedures

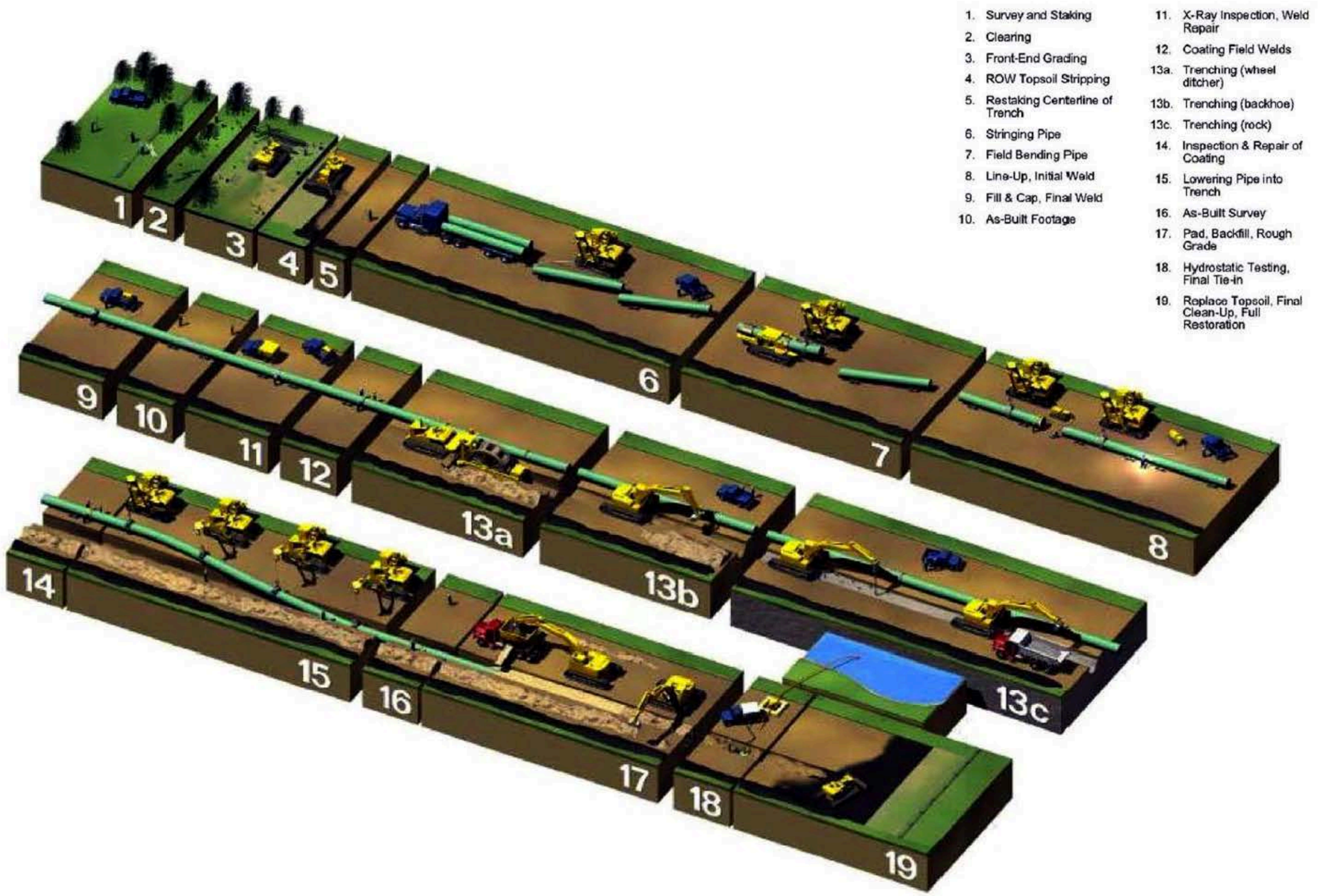
Constructing ACP and SHP pipelines and associated facilities would generally be completed using sequential pipeline construction techniques, which include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; commissioning; and cleanup and restoration (figure 2.3.2-1). These construction techniques would generally proceed in an assembly line fashion, and construction crews would move down the construction right-of-way as work progresses. Construction at any single point along the pipelines, from surveying and staking to cleanup and restoration, could last from about 6 to 12 weeks or longer depending upon the rate of progress, weather, terrain, and other factors.

Specialized construction methods, such as two-tone cut and fill methods used on steep side slopes, HDD and direct pipe methods used to cross under sensitive resources, residential-specific methods, and procedures for crossing of waterbodies and wetlands would also be employed. These specialized construction methods are described in section 2.3.3.

The subsections that follow describe typical construction procedures. Additional measures that would apply on NFS lands are included in the *COM Plan* (see section 2.3.1.2 and appendix G).

2.3.2.1 Survey and Staking

After Atlantic and DETI complete land or easement acquisition and before the start of construction, civil survey crews would stake the limits of the construction right-of-way, the centerline of the proposed trench, ATWS, and other approved work areas. Property owners would be notified prior to surveying and staking activities. Atlantic and DETI would mark approved access roads using temporary signs or flagging and the limits of approved disturbance on any access roads requiring widening. Atlantic and DETI would mark other environmentally sensitive areas (e.g., waterbodies, cultural resources, and sensitive species) where appropriate. Property markers and old survey monuments would be referenced and marked, and replaced during restoration. Typically land surveying is done using all-terrain vehicles (ATV) and pick-up trucks.



Source: NRG, 2000

Figure 2.3.2-1
Construction Sequence Overview
Atlantic Coast Pipeline and Supply Header Project

2.3.2.2 Clearing and Grading

Prior to beginning ground-disturbing activities, Atlantic's and DETI's construction contractors would contact the One-Call system for each state/commonwealth to locate, identify, and flag existing underground utilities to prevent accidental damage during pipeline construction. Once this process is complete, the clearing crew would mobilize to the construction areas. Fences along the rights-of-way would be cut and braced, and temporary gates and fences would be installed to contain livestock, if present. Clearing and grading would remove trees, shrubs, brush, roots, and large rocks from the construction work area and would level the right-of-way surface to allow operation of construction equipment. Vegetation would generally be cut or scraped flush with the surface of the ground, leaving rootstock in place where possible. Cleared vegetation and stumps would either be burned, chipped (except in wetlands), or hauled offsite to a commercial disposal facility. Timber, brush, and other materials cleared from the construction corridor would be placed alongside the construction right-of-way for beneficial reuse, stabilization, or habitat restoration per landowner approval; open burned or chipped/ mulched within the construction right-of-way; or hauled offsite to an appropriate disposal location as outlined in the *Timber Removal Plan* (see table 2.3.1-1). Any open burning would be conducted in accordance with applicable state/commonwealth and local regulations, project plans, and the *Fire Prevention and Suppression Plan* (*Fire Plan*) (see table 2.3.1-1).

Grading would be conducted where necessary to provide a reasonably level work surface. More extensive grading would be required in uneven terrain and where the right-of-way traverses steep slopes and side slopes. Atlantic and DETI have indicated that they would separate topsoil from subsoil as outlined in the FERC *Plan* and *Procedures*. Typically, on non-NFS lands topsoil would be segregated from subsoil in non-saturated wetlands, cultivated or rotated croplands, managed pastures, hayfields, residential areas, and in other areas requested by the landowner or land managing agency unless Atlantic or DETI are instructed by a landowner or land managing agency not to do so or Atlantic or DETI import topsoil in accordance with the FERC *Plan*. In soils with less than 12 inches of topsoil, the entire topsoil layer would be segregated. On NFS lands, the FS has indicated it would require segregation of all topsoil, regardless of depth or land use. During backfilling, subsoil would be returned to the trench first. Topsoil would follow such that spoil would be returned to its original horizon. On NFS lands, the FS has indicated that topsoil with invasive species present would be isolated and/or treated as per the *COM Plan* to prevent the spread of invasive species to new areas during construction, and to prevent re-establishment after construction. If the ground is relatively flat and does not require topsoil segregation or grading, the existing vegetation mat would be peeled and removed similar to topsoil and stockpiled along the right-of-way for use in restoration.

Temporary erosion controls would be installed along the construction right-of-way immediately after initial disturbance of the soil and would be maintained throughout construction. Temporary erosion control measures would remain in place until permanent erosion controls are installed or restoration is completed. Atlantic and DETI have committed to employing Environmental Inspectors (EI) during construction to help determine the need for erosion controls and ensure that they are properly installed and maintained. Additional discussion of EI responsibilities is provided in section 2.5.2.

2.3.2.3 Trenching

Soil and bedrock would be removed to create a trench into which the pipeline would be placed. A rotary trenching machine, track-mounted excavator, or similar equipment would be used to dig the pipeline trench. When rock is encountered, tractor-mounted mechanical rippers, hydraulic hoe rams, or rock trenchers would be used to fracture the rock prior to excavation. If rock cannot be removed by any of these techniques, blasting may be required to fracture the rock prior to its removal (see section 2.3.2.4).

The trench would be excavated to a depth that would provide sufficient cover over the pipeline in accordance with DOT standards in 49 CFR 192.327 (see section 4.12.1 for detailed depth of cover requirements). Typically, the trench would be deep enough (about 8 feet deep for the 42- and 36-inch-diameter ACP mainlines, about 7 feet for the 30-inch-diameter SHP looplines, and 6 feet deep for the 20- and 16-inch-diameter ACP laterals) to provide a minimum of 3 feet of cover over the top of the pipe after backfilling. Excavations could be deeper in certain locations, such as at road, stream, and ridgetop crossings. Less cover would be provided in rocky areas. Additional cover (above DOT standards) could also be negotiated at a landowner's request to accommodate specific land use practices. Additional depth of cover generally requires a wider construction right-of-way (resulting in greater temporary disturbance) to store the additional trench spoil. Spoil material excavated from the trench would be temporarily piled to one side of the right-of-way, adjacent to the trench. Subsoil would not be allowed to mix with the previously stockpiled topsoil.

Dewatering of the pipeline trench may be required in areas with a high water table or after a heavy rain. All trench water would be discharged into well-vegetated upland areas or properly constructed dewatering structures to allow the water to infiltrate back into the ground. If trench dewatering is necessary in or near a waterbody, the removed trench water would be discharged into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale structure located away from the water's edge to prevent heavily silt-laden water from flowing into nearby waterbodies in accordance with the FERC *Procedures*, construction plans, and all applicable permits. Any contaminated soil or groundwater encountered during grading or excavations would be managed in accordance with the *Contaminated Media Plan* (see table 2.3.1-1).

2.3.2.4 Rock Removal and Blasting

Blasting would be required in areas where mechanical equipment cannot break up or loosen the bedrock (see section 2.3.2.3). Atlantic and DETI would implement the project-specific *Blasting Plan* that was developed in accordance with industry accepted standards, applicable regulations, and permit requirements (see table 2.3.1-1). For each area determined to require blasting within 500 feet of an identified water well or within 150 feet of any aboveground and underground structures including pipelines, domestic structures, oil and gas wells, electrical transmission tower footings, environmentally sensitive areas such as streams and wildlife areas, and other utilities, a site-specific blast plan prepared by the construction contractor would be submitted to Atlantic for approval.

Typical blasting applications include mass rock blasting, typical for grading large areas at construction sites or when building roadways; production blasting (open pit) used in quarry and strip mining; and trench blasting, typical in construction of pipelines and other below-ground utilities. Atlantic and DETI would be conducting trench blasting to break rock that is encountered before the required trench depth is achieved. Trench blasting is more confined than a normal open pit blast and results in lower explosives consumption per cubic feet of blasted rock. The diameter of trench blast holes is normally smaller, which provides better distribution of the explosive in the rock, avoids excessive overbreak outside the width of the trench, and helps avoid high peak overpressure (noise) and high peak particle velocity (vibration) readings. Trench blasting is controlled with a "precision blast design" by a certified blasting professional. Blasting would produce a one-time vibration and peak overpressure that is very short in duration. By comparison, the mechanical rock removal techniques described in section 2.3.2.3, which break up the rock prior to excavation, produce a vibration with a consistent frequency for long periods of time (days to weeks, depending on site conditions); as such, mechanical rock removal techniques would potentially result in increased impacts from vibrations and frequencies for longer periods of time. Trench blasting produces a higher vibration for a very short period of time (milli-seconds), and frequency can be adjusted through timing of the blast. As such, trench blasting is considered to have lesser impact on the environment than mass rock and production blasting because of the shorter duration and ability to adjust frequencies for each blast.

Atlantic and DETI would adhere to strict safety precautions during blasting and would exercise care to prevent damage to nearby structures, utilities, wells, springs, and other important resources. Blasting would only be conducted during daylight hours. The blasting contractor would provide landowners and tenants at least 48 hours advance notice to protect property or livestock. Blasting mats or padding would be used where necessary to prevent fly rock from scattering. All blasting activities would be performed in compliance with federal, state/commonwealth, and local codes, ordinances, and permits; manufacturers' prescribed safety procedures; and industry practices. Impacts of blasting on various resources and details about the measures to mitigate the impacts of blasting on these resources are discussed in sections 4.1.2, 4.3.1.7, 4.3.2.6, 4.5, 4.6.4, and 4.7.

2.3.2.5 Pipe Stringing, Bending, Welding, and Coating

Once the trench is excavated, the next process in conventional pipeline construction is stringing the pipe along the trench. Stringing involves initially hauling the pipe by tractor-trailer, generally in 40-foot lengths (referred to as "joints"), from contractor yards to the construction right-of-way. The pipe would be off-loaded from trucks and placed next to the trench using a sideboom tractor. The pipe would be delivered to the job site with a protective coating of fusion-bonded epoxy or other approved coating that would inhibit corrosion by preventing moisture from coming into direct contact with the steel. Typically, several pipe joints are lined up end-to-end or "strung" to allow for welding into continuous lengths known as strings. Individual joints would be placed on temporary supports or wooden skids and staggered to allow room for work on the exposed ends.

The pipe would be delivered to the contractor yards and work areas in straight sections. Some bending of the pipe would be required to enable the pipeline to follow the natural grade of the trench and direction changes of the right-of-way. Selected joints would be bent by track-mounted hydraulic bending machines as necessary prior to line-up and welding. Manufacturer supplied induction bends and pre-fabricated elbow fittings may be used in certain circumstances as needed. Following stringing and bending, the individual joints of pipe would be aligned and welded together. All welding would be performed according to applicable American National Standards Institute, American Society of Mechanical Engineers, and American Petroleum Institute standards, as well as Atlantic and DETI specifications. Only welders qualified to meet the standards of these organizations would be used during construction. Every completed weld would be examined by a welding inspector to determine its quality using radiographic or other approved methods as outlined in 49 CFR 192. Radiographic examination is a nondestructive method of inspecting the inner structure of welds and determining the presence of defects. Welds that do not meet the regulatory standards and Atlantic's and DETI's established specifications would be repaired or removed.

Once the welds are made, a coating crew would coat the area around the weld with additional epoxy or other coating before the pipeline is lowered into the trench. Prior to application, the coating crew would thoroughly clean the bare pipe with a power wire brush or sandblast machine to remove dirt, mill scale, and other debris. The crew would then apply the coating and allow it to dry. On NFS lands, the FS would require that all coating be pre-applied to pipes prior to being brought onto NFS lands. Where welds need to be made, the FS stated epoxy coating may be applied by hand on-site in the trench; however, no epoxy application would be permitted to be sprayed or splattered into the surrounding environment. Further, the FS would require any mixing of materials to take place in a specialized area where any spill or potential contamination could be contained, thus avoiding contact with the soil.

The pipeline would be inspected electronically (also referred to as "jeeped" because of the sound of the alarm on the testing equipment) for faults or voids in the coating and would be visually inspected for scratches and other defects. Atlantic and DETI would repair any damage to the coating before the pipeline is lowered into the trench.

Special tie-in crews would be used at some locations, such as at waterbody and road crossings, at changes in topography, and at other selected locations as needed. A tie-in is typically a relatively small segment of pipeline specifically used to cross certain features as needed. Once the pipeline segment is installed across the feature, the segment is then welded to the rest of the pipeline.

2.3.2.6 Lowering-In and Backfilling

Before the pipeline is lowered-in, the trench would be inspected to ensure that it is free of rocks and other debris that could damage the pipe or protective coating. Typically, any water that is present in the trench would be removed and pumped to a vegetated upland through an approved filter. The pipeline would then be lowered into the trench by a series of side-boom tractors (tracked vehicles with hoists on one side and counterweights on the other), which would carefully lift the pipeline and place it on the bottom of the trench. After the pipe is lowered into the trench, final tie-in welds would be made and inspected.

In rocky areas or where the trench contains bedrock, padding material such as sand, approved foam (except on NFS lands), or other protective materials would be placed in the bottom of the trench to protect the pipeline. A padding machine may be used to ensure that rocks mixed with subsoil do not damage the pipe. The padding would consist of subsoil free from rocks and would surround the pipe along the bottom, both sides, and at the top. Topsoil would not be used as padding material. Where sufficient padding material is not available on site, or when the native material that was excavated from the trench is rocky or otherwise not suitable for backfill material, the acquisition of backfill from other sources may be necessary. The FS has indicated that all off-site sources for backfill to be used on NFS lands must be free from contaminants and invasive species and must be pre-approved by FS personnel.

Trench breakers (stacked sand bags or polyurethane foam) would then be installed in the trench on slopes at specified intervals to prevent subsurface water movement along the pipeline. The trench would then be backfilled using the excavated material. All suitable material excavated during trenching would be re-deposited into the trench using bladed equipment or backhoes. If rock is excavated from the trench and subsequently used as backfill, it would not be allowed to extend above the soil horizon where it naturally is found. A crown of soil about the width of the trench and up to 1 foot high may be left over the trench to compensate for settling. Appropriately spaced breaks may be left in the crown to prevent interference with stormwater runoff. The topsoil is then spread across the graded construction right-of-way when applicable. The soil would be inspected for compaction and scarified, as necessary.

2.3.2.7 Internal Pipe Cleaning and Hydrostatic Testing

After burial, the inside of the pipeline would be cleaned to remove any dirt, water, or debris inadvertently collected in the pipe during installation. A manifold would be installed on one end of the pipeline section and a cleaning pig (typically a large soft plug used to swab the inside of the pipeline) would be propelled by compressed air through the pipeline.

After cleaning, the pipeline would be hydrostatically tested to ensure that the system is capable of withstanding the operating pressure for which it was designed. Hydrostatic testing involves filling the pipeline with water and pressurizing the water in the pipeline for several hours to confirm the pipeline's integrity. The testing would be done in segments according to Atlantic's and DETI's requirements and the DOT's specifications in 49 CFR 192. Any leaks would be repaired and the section of pipe retested until the required specifications were met. At the completion of the hydrostatic test, the pressure is removed from the test section and the water is released from the test section. Test water discharges would be completed according to the FERC *Procedures*, Atlantic's and DETI's construction and restoration plans, and other permit requirements. No hydrostatic test water would be discharged on NFS lands or on adjacent lands where discharges could move downslope to NFS lands.

Water for hydrostatic testing would be obtained from surface waterbodies (except within the MNF or GWNF) and municipal water sources. Water appropriated from surface waters would be temporarily stored in cylindrical water impoundment structures.[5] These steel structure would be installed above ground, bolted together, and lined with an impermeable geotextile membrane that is clamped in place. Hydrostatic test water would contact only new pipe and no chemicals would be added to the water. Section 4.3.2.7 provides additional information on hydrostatic testing and the location of water impoundment structures.

2.3.2.8 Commissioning

Commissioning involves verifying that equipment has been properly installed and is working, verifying that controls and communications systems are functioning, and confirming that the pipeline is ready for service. In the final step, the pipeline would be prepared for service by purging the pipeline of air and loading it with natural gas. Atlantic and DETI would not be authorized to place the pipeline facilities into service until written permission is received from the Director of the FERC's Office of Energy Projects (OEP).

2.3.2.9 Cleanup and Restoration

Within 20 days of backfilling the trench (10 days in residential areas), all work areas would be graded and restored to preconstruction contours and natural drainage patterns as closely as possible. Permanent slope breakers or diversion berms would be constructed and maintained in accordance with Atlantic's and DETI's construction and restoration plans. Fences, sidewalks, driveways, stone walls, and other structures would be restored or repaired as necessary. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls would be maintained until conditions allow completion of final cleanup.

On non-NFS lands, topsoil and subsoil would be tested for compaction at regular intervals in agricultural areas disturbed by construction activities, and severely compacted agricultural areas would be plowed. The FS would require decompaction of all areas crossed by the portion of ACP on NFS lands. Cut and scraped vegetation in the storage area would be spread back across the right-of-way. Some large shrubs and trees cut during clearing may be spread back across the right-of-way to impede vehicular traffic and other unauthorized access or hauled away for disposal in accordance with applicable laws. Surplus construction material and debris would be removed from the right-of-way unless the landowner or land-managing agency approves otherwise. Excess rock/stone would be removed from at least the top 12 inches of soils in agricultural and residential areas and, at the landowner's request, in other areas. Atlantic and DETI would remove excess rock/stone such that the size, density, and distribution of rock on the construction right-of-way would be similar to adjacent non-right-of-way areas. Landowners are also

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[5] Photographs and specifications of water impoundment structures can be found under FERC Accession No. 20160701-5255 at the following website location (under the Files, select the PDF files titled "PUBLIC_6.13 DR_Question 15 Attachment 1.pdf): http://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20160701-5255

at liberty to negotiate certain specific construction requirements and restoration measures directly with Atlantic or DETI.

Restoration activities would be completed in accordance with landowner agreements, permit requirements, and written recommendations on seeding mixes, rates, and dates obtained from the local conservation authority or other duly authorized agency and in accordance with Atlantic's and DETI's construction and restoration plans. The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting. Alternative seed mixes specifically requested by the landowner or required by agencies may be used. Any soil disturbance that occurs outside the permanent seeding season or any bare soil left unstabilized by vegetation would be mulched to minimize erosion, in accordance with Atlantic's and DETI's construction and restoration plans. Additional discussions of restoration activities are provided in sections 4.2, 4.4, and 4.8.

Markers showing the location of the pipeline would be installed along the pipeline rights-of-way according to Atlantic and DETI specifications as well as at fence, road, and railroad crossings to identify the owner of the pipeline and convey emergency information in accordance with applicable governmental regulations, including DOT safety requirements. Special markers providing information and guidance for aerial patrol pilots would also be installed.

Any property damaged during construction would be restored to its original or better condition in accordance with individual landowner agreements. Access road improvements would be removed after construction, and affected roads would be restored to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place.

Following construction, Atlantic and DETI, as well as FERC staff, would conduct follow-up inspections to monitor the restoration and revegetation of all areas disturbed during construction (see section 2.5.6).

2.3.3 Special Pipeline Construction Procedures

Special construction techniques are required when a pipeline is installed across waterbodies, wetlands, roads, foreign utilities, steep slopes, residences, agricultural lands, and other sensitive environmental resources such as the ANST. In general, ATWS adjacent to the construction right-of-way would be used at most of these areas for staging construction, stockpiling spoil, storing materials, maneuvering equipment, and fabricating pipe. General procedures are described below; more specific procedures are further discussed in section 4, as applicable. Additional measures that would apply on NFS lands are included in the *COM Plan* (see appendix G).

2.3.3.1 Waterbody Crossings

Waterbody crossings would be completed in accordance with the measures described in the FERC *Procedures*, Atlantic's and DETI's construction plans, and in accordance with federal, state/ commonwealth, and local permits as summarized below. The waterbodies that would be crossed by each project and the proposed crossing method for each waterbody crossings are listed in in appendix K and discussed in section 4.3.2.

ATWS necessary for waterbody crossings would be located a minimum of 50 feet from the waterbody edge, except where adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. The 50-foot setback would be maintained unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. Additional ATWS setbacks may be required on FS administered lands to comply with riparian setback standards, and would become conditioned as part of the SUP process (see section 4.3.2.8). As stated above in section 2.3.1.1, we have determined that Atlantic's and DETI's request to locate certain ATWS within 50 feet of waterbodies is acceptable. However, our review of waterbody crossings (appendix K), and Atlantic's and DETI's proposed workspaces indicate there are additional modifications to our *Procedures* that are not listed and justified in table 2.3.1-2. Therefore, we have recommended that Atlantic and DETI should design all workspaces not identified in table 2.3.1-2 to comply with the FERC's *Procedures*. Any additional modifications to the FERC *Procedures* must be requested and justified in Atlantic's and DETI's Implementation Plans.

To prevent sedimentation caused by equipment traffic crossing through waterbodies, Atlantic and DETI would install and maintain temporary equipment bridges during construction. Bridges may include clean rock fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatuses, or other types of spans. Each bridge would be designed to accommodate normal to high streamflow (storm events) and would be maintained to prevent soil from entering the waterbody and to prevent restriction of flow during the period the bridge is in use. Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas.

The pipeline would be installed using one of the waterbody crossing methods described below. Trench spoil would be placed on the banks above the high water mark for use during backfilling. In most cases, Atlantic and DETI would place at least 4 feet of cover over the pipeline at waterbody crossings; except in consolidated rock, where there would be a minimum of 2 feet of cover. Additional depth of cover may be necessary to minimize scour potential. After installation, the trench would be backfilled with native material excavated from the trench. If present and moved prior to construction, larger rocks or boulders would be replaced in the stream channel within the construction area following backfill of the trench. The streambed profile would be restored to pre-existing contours and grade conditions to prevent scouring. The stream banks would then be restored as near as practicable to pre-existing conditions and stabilized. Stabilization measures could include seeding, tree planting, installation of erosion control blankets, or installation of riprap materials, as appropriate. Jute thatching or bonded fiber blankets would be installed on banks of waterbodies or road crossings to stabilize seeded areas. Temporary erosion controls would be installed immediately following bank restoration. The waterbody crossing area would be inspected and maintained until restoration of vegetation is complete.

Wet Open-cut Construction Method

The wet open-cut construction method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting streamflow (i.e., the stream flows through the work area throughout the construction period). With the wet open-cut method, the trench is excavated across the stream using trackhoes or draglines working within the waterbody, on equipment bridges, and/or from the streambanks. Once trench excavation across the entire waterbody is complete, a prefabricated section of pipe is promptly lowered into the trench. The trench is then backfilled with the previously excavated material, and the pipe section tied-in to the pipeline. Following pipe installation and backfilling, the streambanks are then re-established to approximate preconstruction contours and stabilized. Erosion and sediment control measures are then installed across the right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

Flume Construction Method

The flume method involves diverting the flow of water across the construction work area through one or more flume pipes placed in the waterbody. The first step in the flume crossing method involves placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. After placing the flume pipe(s) in the waterbody, sand bags or equivalent dam diversion structures are placed in the waterbody upstream and downstream of the trench area. These devices serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Flume pipes are left in place during pipeline installation until final cleanup of the streambed is complete.

Dam and Pump Construction Method

The dam and pump method is similar to the flume crossing method except that pumps and hoses are used instead of flumes to move water across the construction work area. The technique involves damming of the waterbody with sandbags and/or clean gravel with a plastic liner upstream and downstream of the trench area. Pumps are set up at the upstream dam with the discharge line routed through the construction area to discharge water immediately downstream of the downstream dam. An energy dissipation device is typically used to prevent scouring of the streambed at the discharge location. Water flow is maintained through all but a short reach of the waterbody at the actual crossing. After the pipe is installed in the trench, the trench is backfilled, the dams removed, and the banks restored and stabilized.

Cofferdam Method

The cofferdam method involves the installation of a temporary diversion structure from one bank of the waterbody to the approximate midpoint of the waterbody crossing to isolate that section of the stream from the rest of the waterbody. Once the temporary diversion structure is installed, water is pumped from inside the diversion structure to allow excavation of the pipe trench from the bed of the waterbody. After the pipe is installed in the trench, the trench is backfilled and the temporary diversion structure is disassembled and then reinstalled from the opposite bank of the crossing and the process is repeated. The cofferdam method allows waterbodies to be crossed by creating discrete dry sections around which water flows unimpeded around the temporary diversion structure.

2.3.3.2 Trenchless Methods

Trenchless construction methods are those that install the pipeline beneath a waterbody, wetland, road, or other sensitive feature by drilling or tunneling under the feature and without the excavation of an open trench. Each of these trenchless methods is described below.

Conventional Bore Method

Conventional boring consists of creating a tunnel-like shaft for a pipeline to be installed below roads, waterbodies, wetlands, or other sensitive resources without affecting the surface of the resource. Bore pits are excavated on both sides of the resource to the depth of the adjacent trench and graded to match the proposed slope of the pipeline. A boring machine is then used within the bore pit to tunnel under the resource by using a cutting head mounted on an auger. The auger rotates and advances forward as the hole is bored. Once the hole is bored, a pre-fabricated section of pipe is pushed through the borehole. At particularly long crossings, pipe sections may be welded onto the pipe string just before being pushed through. Due to the depth of the bore pit and proximity to water resources, this method may require use of sheet pile to maintain the integrity of the pits and use of well point dewatering systems to avoid flooding of the pits. Borings are usually conducted 24 hours per day and typically require between 2 and 10 days to complete from start to finish.

Horizontal Directional Drilling Construction Method

An HDD involves drilling a hole under the feature (e.g., waterbody, road) and installing a pre-fabricated pipe segment through the hole. Table 2.3.3-1 lists the locations where Atlantic proposes to use the HDD method; the HDD method is not proposed for any portion of SHP.

TABLE 2.3.3-1

Horizontal Directional Drills for the Atlantic Coast Pipeline

Feature	County/City, State/Commonwealth	Facility/Milepost
Interstate 79	Lewis County, WV	AP-1 14.0
BRP /ANST	Augusta and Nelson Counties, VA	AP-1 157.8
James River (including Mayo Creek)	Nelson/Buckingham County line, VA	AP-1 184.7
Roanoke River	Northampton/Halifax County line, NC	AP-2 9.9
Fishing Creek (including Unnamed Tributary (UNT) to Fishing Creek)	Halifax and Nash Counties, NC	AP-2 33.9
Swift Creek	Nash County, NC	AP-2 40.6
Tar River	Nash County, NC	AP-2 59.4
Contentnea River	Wilson County, NC	AP-2 73.6
Little River (including 2 UNT to Little River)	Johnston County, NC	AP-2 82.5
Cape Fear River (including 2 UNT to Cape Fear River)	Cumberland County, NC	AP-2 154.2
Nottoway River	Southampton County, VA	AP-3 32.6
Blackwater River	Southampton County/City of Suffolk line, VA	AP-3 38.6
Lake Prince (two arms and UNT to Lake Prince)	City of Suffolk, VA	AP-3 61.0
Western Branch Reservoir	City of Suffolk, VA	AP-3 62.4
Western Tributary to Nansemond River	City of Suffolk, VA	AP-3 63.6
Nansemond River	City of Suffolk, VA	AP-3 64.4
Route 58	Nansemond County, VA	AP-3 71.0
Interstate 64	City of Chesapeake, VA	AP-3 77.8
Route 17 (including UNT to Deep Creek and ditch)	City of Chesapeake, VA	AP-3 78.6
South Branch Elizabeth River (part of the Intracoastal Waterway; including UNT to South Branch Elizabeth River)	City of Chesapeake, VA	AP-3 81.8

The first step in an HDD is to drill a small diameter pilot hole from one side of the crossing to the other using a drill rig. As the pilot hole progresses, segments of drill pipe are inserted into the hole to extend the length of the drill. The drill bit is steered and monitored throughout the process until the desired pilot hole had been completed. The pilot hole is then enlarged using several passes of successively larger reaming tools. Once reamed to a sufficient size, a pre-fabricated segment of pipe is attached to the drill string on the exit side of the hole and pulled back through the drill hole toward the drill rig. HDD activities would take place on a continuous 24-hour per day/7-day per week schedule. Depending on the substrate, drilling and pull back can last anywhere from a few days to a few weeks.

The HDD method utilizes a slurry referred to as drilling mud, which is composed of approximately 65 percent water and 30 bentonite, a naturally occurring clay mineral that can absorb up to 10 times its weight in water (the remaining 5 percent consists of additives such as barium sulfate [barite], calcium carbonate [chalk], or hematite). Bentonite-based drilling mud is a non-toxic, non-hazardous material that is also used to construct potable water wells throughout the United States. The drilling mud is pumped under pressure through the inside of the drill pipe and flows back (returns) to the drill entry point along the outside of the drill pipe. The purpose of the drilling mud is to lubricate the drill bit and convey the drill cuttings back to the drill entry point where the mud is reconditioned and re-used in a closed circulating process. Drilling mud also forms a cake on the rock surface of the borehole, which helps to keep the drill hole open and maintain circulation of the drilling mud system. Because the drilling mud is pressurized, it can be lost, resulting in an inadvertent release or "hydrofracture," if the drill path encounters fractures or fissures that offer a path of least resistance or near the drill entry and exit points where the drill path has the least amount of ground cover.

The potential for an inadvertent release is typically greatest during drilling of the initial pilot hole and decreases once the pilot hole has been completed. The volume of mud lost would depend on several factors, including the size of the fault, the permeability of the geologic material, the viscosity of the drilling mud, and the pressure of the drilling system. A drop in drilling pressure (or loss of returns to the drilling rig altogether) would indicate that a release may be occurring, and the release may not be evident from the ground surface if the mud moves laterally. For a release to be evident, there must be a fault or pathway extending vertically to the surface. The migration of fluids could also occur horizontally, for instance in folded or fractured formations or in proximity to shallow groundwater such as perched aquifers/seeps/springs. On non-NFS lands, pits or containment structures can be constructed to contain drilling mud released to the surface of the ground, and a pump may be used to transfer the drilling mud from the pit or the structure to a containment vessel. On NFS lands, the FS would only consider closed loop systems with containment tanks. A release underground is typically more difficult to contain and is often addressed by thickening the drilling mud, stopping drilling all together, or continuing to drill past the fault or blockage to re-establish the bore hole as the path of least resistance.

It is possible for HDD operations to fail, primarily due to encountering unexpected geologic conditions during drilling or if the pipe were to become lodged in the hole during pullback operations. Potential causes for abandoning a drill hole include the loss of drill bits or pipe down the hole due to a mechanical break or failure; a prolonged release of drilling mud that cannot be controlled; failure of the HDD pullback where a section of pipe cannot be retracted and has to be abandoned; or an inability to correct a severe curvature of the pilot hole drill path. In the event such an occurrence happens with the proposed projects, reasonable attempts would be made to overcome the obstacles preventing successful completion of the drill. Such measures could include re-drilling the pilot hole in a slightly different location or re-conditioning of the pilot hole. Atlantic would be required to seek approval from the Commission and other applicable agencies prior to abandoning any HDD (or direct pipe) crossing in favor of another construction method.

Atlantic has prepared a *Horizontal Directional Drill Drilling Fluid Monitoring, Operations, and Contingency Plan* (*HDD Plan*) that describes the drilling techniques and other measures that would be implemented to minimize and address potential issues associated with HDD crossings, including the potential for an inadvertent loss of drilling mud (see appendix H). Appendix H also includes Atlantic's site-specific plans for each HDD crossing.

We received comments regarding the feasibility of successfully completing the BRP/ANST HDD,[6] specifically that:

1. insufficient geotechnical evaluations were completed;

2. workspace designs are incomplete;

3. the risk of HDD failure is significant; and

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[6] A report "A High-Risk Proposal – Drilling Through the Blue Ridge Mountains for the Atlantic Coast Pipeline" was filed as part of these comments and can be found under FERC Accession No. 20170207-5072 at the following website location: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170207-5072.

4. installation of the pipeline is not feasible due to the suspension height necessary to maintain a safe bending radius of a 42-inch-diameter pipe.

Atlantic completed geotechnical borings at the entry and exit locations that were about 450 and 600 feet downslope of the exit and entry points, respectively. Atlantic also completed resistivity imaging and seismic refraction studies at the entry and exit locations to further characterize and confirm geologic conditions. Due to the depth of the crossing, less than 25 percent of the drill path was within the feasible limits of a geophysical investigation. However, we have reviewed the geotechnical information filed by Atlantic and have determined that the borings completed at the specific entry and exit points, combined with the geophysical studies, adequately characterize subsurface conditions at the drill site. Due to the crossing depths under the mountain, further geophysical studies are not practical or warranted. Additionally, we do not believe the presence of fractured and faulted rock identified by the geophysical studies would render the HDD infeasible or significantly increase the risk of drill failure. To minimize drill failure, Atlantic would install drill casing through unconsolidated overburden (alluvium) and into competent bedrock on both ends of the crossing to minimize the risk of the drill hole collapsing around the pullback section.

We have also reviewed the drill and pullback workspaces and find them adequate, and believe the drill workspaces account for excavations needed to create a level working area.

Lastly, the commentor indicated that the safe bending radius of a 42-inch-diameter pipeline is 4,200 feet, and accordingly, the pullback section of pipe would require a suspended maximum height of 190 feet and distance of 2,000 feet before it enters the drill hole. We note that the commentor utilized a 10-degree exit angle while Atlantic proposes an 8-degree exit angle, and the topographic information used to estimate height and distance by the commentor does not correlate to LiDAR and civil survey information filed by Atlantic. On May 26, 2017, Atlantic filed supplemental information related to the HDD pullback and bending radius of the pipeline. Atlantic stated that based on the proposed pipeline's specified minimum yield strength, a bending radius of 967 feet is feasible, and would significantly reduce the height and distance requirements of the pipeline as it enters the HDD hole. Based on site characteristics and design information, we find the HDD feasible. Additionally, the FS, and its independent 3rd-party technical consultant, found that the HDD, as proposed by Atlantic, would be feasible.

Direct Pipe Method

The direct pipe method is another trenchless construction method that is similar to HDD, but is also combined with processes related to microtunnelling. A single continuous process allows the trenchless installation of pre-fabricated pipeline to occur simultaneously with the development of the bore hole. A direct pipe installation is different from an HDD because a much larger initial cutterhead is used, eliminating the reaming process. Excavation and hole boring is performed with a navigable microtunnelling machine and a cutterhead. Temporary flushing pipes located inside the pipeline are used to transport the drilling fluids to the cutterhead and earthen cuttings to the surface. The pressure used to advance the boring process and simultaneously install the pipeline is applied directly to the pipeline by a piece of equipment called a pipe thruster. The force applied on the pipeline pushes the cutting head forward. The pipeline is carefully monitored during this process to ensure accurate measurement of the pipe's location along the intended pathway.

Direct pipe installations may be shorter and shallower than HDD installations because the bore hole is continuously cased, thereby limiting the risk of hole collapse and the inadvertent release of drilling fluids. Although the direct pipe method is not currently proposed for the projects, it may be used as a contingency crossing method should a HDD crossing fail.

2.3.3.3 Wetland Crossings

Wetland crossings would be completed in accordance with federal and state/commonwealth permits and follow the measures described in the construction plans. The wetlands that would be crossed are listed in appendix L and are discussed further in section 4.3.3.

Atlantic and DETI would typically use a 75-foot-wide construction right-of-way through wetlands unless site-specific approval for an increased right-of-way width is granted by the FERC and other jurisdictional agencies. ATWS may be required on both sides of wetlands to stage construction equipment, fabricate the pipeline, and store materials. On non-NFS lands, ATWS for wetland crossings would be in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. As stated in section 2.3.1.1, we have determined that Atlantic's and DETI's request to locate certain ATWS within 50 feet of wetlands and the request for expanded workspace within certain wetlands is acceptable. However, our review of wetland crossings (appendix L), and Atlantic's and DETI's proposed workspaces indicate there are additional modifications to our *Procedures* that are not listed and justified in table 2.3.1-2. Therefore, we have recommended that Atlantic and DETI should design all workspaces not identified in table 2.3.1-2 to comply with the FERC's *Procedures*. Any additional modifications to the FERC *Procedures* must be requested and justified in Atlantic's and DETI's Implementation Plans.

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. Stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trenchline to avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland. A limited amount of stump removal and grading may be conducted in other areas to ensure a safe working environment.

During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize the potential for sediment runoff. Sediment barriers would be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fence or straw bales installed across the working side of the right-of-way would be removed during the day when vehicle traffic is present and would be replaced each night. Sediment barriers would also be installed within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetland areas outside the construction work area. If trench dewatering is necessary in wetlands, the trench water would be discharged in stable, vegetated, upland areas and/or filtered through a filter bag or siltation barrier. No heavily silt-laden water would be allowed to flow into a wetland.

Construction equipment working in wetlands would be limited to that which is essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. In areas of saturated soils or standing water, low-ground-weight construction equipment and/or timber riprap, prefabricated equipment mats, or terra mats would be used to reduce rutting and the mixing of topsoil and subsoil. In unsaturated wetlands on non-NFS lands, the top 12 inches of topsoil from the trenchline would be stripped and stored separately from the subsoil. Topsoil segregation generally would not be possible in saturated soils. However, as previously discussed, the FS would require segregation of all topsoil in all areas, regardless of depth or land use.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique. The push-pull technique involves stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats. The water that seeps into the trench is used as the vehicle to "float" the pipeline into place together with a winch and flotation devices attached to the pipe. After the pipeline is floated into place, the floats are then removed, allowing the pipeline to sink into place. Pipe installed in saturated wetlands is typically coated with concrete or equipped with set-on weights to provide negative buoyancy. After the pipeline sinks to the bottom of the trench, a trackhoe working on equipment mats backfills the trench and completes cleanup. For the proposed projects, trenchless construction techniques, such as conventional bore or HDD, would also be used to cross certain wetlands.

Prior to backfilling, trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Equipment mats, terra mats, and timber riprap would be removed from wetlands following backfilling.

Where wetlands are located at the base of slopes, permanent interceptor dikes and trench plugs would be installed in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the right-of-way and disposed of properly.

2.3.3.4 Karst Sensitive Areas

ACP would cross areas of karst geology in West Virginia and Virginia. Atlantic has developed a *Karst Terrain Assessment, Construction, Monitoring, and Mitigation Plan* (*Karst Mitigation Plan*) that details the project-specific construction, restoration, and mitigation methods that would be implemented to address karst features encountered during construction (see appendix I). A description of karst features that may be crossed by ACP along with our analysis of potential karst impacts is provided in section 4.1.2.3.

2.3.3.5 Steep Slopes

Segments of the AP-1 mainline route extend across steep, mountainous terrain in West Virginia and Virginia along and near the Allegheny, Shenandoah, and Blue Ridge Mountain ranges. In these areas, Atlantic would install and maintain specific temporary and permanent controls to minimize erosion and sedimentation, which can increase due to clearing, grading, and trenching on steep slopes. During construction, temporary slope and trench breakers consisting of compacted earth, sandbags, or other materials would be installed to reduce runoff velocity and divert water off the construction right-of-way. Temporary trench plugs consisting of compacted earth or similar low-permeability material would be installed at the entry and exit points of wetlands and waterbodies to minimize channeling along the ditch and to maintain subsurface hydrology patterns. Additional types of temporary erosion control such as super silt fence, erosion control matting, and hydro-mulching may be used. Upon installation of the pipeline, permanent trench breakers and plugs consisting of sandbags, gravel, foam, cement, or cement-filled sacks would be installed over and around the pipeline, and permanent slope breakers generally consisting of compacted earth and rock would be installed across the right-of-way during restoration. Surface contours and topsoil would be returned to preconstruction conditions, and revegetation of the right-of-way would commence. Atlantic would monitor the right-of-way during operation and take measures as necessary to ensure the effectiveness of erosion control and revegetation.

In the steepest areas, Atlantic would employ a technique called "winching" that involves placing heavy equipment at the top of the slope to serve as an anchor point and then connecting one or more additional pieces of equipment together with a cable. This method provides stability and safety to the equipment operators as work proceeds up and down the steep slope. Atlantic may also implement the two-tone construction method in areas of steep side slopes. During grading, the upslope side of the right-of-way would be cut and the material placed on the downslope side to create a safe, level work area. This method could require additional ATWS to accommodate the downslope spoil. After installation of the pipeline, the spoil would be returned to the upslope cut and the overall grade would be restored. Any springs or seeps found in the upslope cut would be carried downslope through polyvinyl chloride pipe and/or gravel French drains during restoration. Additional steep slope restoration and mitigation measures are described in section 4.1.4.2.

Atlantic and the FS currently are coordinating on site-specific designs for steep slope areas to further mitigate risks of slope failure, erosion, and sedimentation in these areas. Final construction and restoration procedures would be included in the *COM Plan* and/or authorization by the FS.

2.3.3.6 Residential Construction

Construction through or near residential areas would be done in a manner that ensures adverse impacts are minimized and cleanup is prompt and thorough. Access to homes would be maintained, except for the brief periods that are needed to lay the new pipeline.

Atlantic and DETI would implement measures to minimize construction-related impacts on all residences and other structures located within 50 feet of the construction right-of-way, including: 1) install safety fence at the edge of the construction right-of-way for a distance of 100 feet on either side of the residence or business establishment; 2) attempt to leave mature trees and landscaping intact within the construction work area unless the trees and landscaping interfere with the installation techniques or present unsafe working conditions; 3) backfill the trench as soon as possible after the pipe is laid or temporarily place steel plates over the trench; 4) complete final cleanup, grading, and installation of permanent erosion control devices within 10 days after backfilling the trench, weather permitting; and 5) restore private property such as fences, gates, driveways, and roads disturbed by pipeline construction to original or better condition upon completion of construction activities.

Atlantic and DETI have generated site-specific *Residential Construction Plans* (RCPs) for properties that have active structures within 50 feet of the construction workspace (see appendix J). The RCPs are used to inform landowners of precise location of project workspaces, identify measures to minimize disruption during construction, and to maintain access to the residences. The RCPs are described further in section 4.8.3. Affected landowners are encouraged to review the RCPs and provide us with any comments or concerns.

2.3.3.7 Agricultural Areas

Agricultural areas crossed by ACP and SHP are identified in section 4.8.1. To conserve topsoil, Atlantic and DETI propose to segregate a maximum of 12 inches of topsoil in all actively cultivated and rotated croplands, pastures, and hayfields and in other areas at the specific request of the landowner or land management agency. Where topsoil is less than 12 inches deep, the actual depth of the topsoil layer would be removed and segregated. The topsoil would be stored in separate rows on the construction right-of-way and replaced to the upper soil layer during backfilling.

In areas where irrigation or drainage systems would be crossed, Atlantic and DETI would identify any crossing locations during civil survey. Irrigation and drainage systems would be permanently repaired during backfill and cleanup.

2.3.3.8 Road, Railroad, and Trail Crossings

Atlantic and DETI would install the pipeline under roads, railroads, FS system roads, and some FS trails in accordance with crossing permits and applicable laws and regulations. Generally, railroads and roads where traffic cannot be detoured would be crossed by boring beneath the road or railroad. This crossing method would allow uninterrupted use of the road or rail throughout construction.

Most gravel and dirt roads, driveways, and roads in areas with a high water table, as well as most FS system trails, would be crossed by the open-cut method, which would require temporary closure of the road or trail and the establishment of detours. Roads would be closed only where allowed by permit or landowner/land-managing agency consent. Most open-cut road or trail crossings require only a few days to complete, although resurfacing could require several weeks to allow for soil settlement and compaction. Atlantic and DETI would implement measures to maintain access to residences where possible, such as placing steel plating over the trench to allow traffic to pass.

In addition to the methods described above, Atlantic has identified five roads that would be crossed using the HDD method (Interstate 79, the BRP [including the ANST], Route 58, Interstate 64, and Route 17). The HDD crossings of these roads would use the same methods as those described in section 2.3.3.2. In the event the HDD crossing of the BRP/ANST is unsuccessful, Atlantic has prepared a contingency plan to utilize the direct pipe method (see section 2.3.3.2 and appendix H).

Atlantic and DETI would construct all road and railroad crossings in accordance with DOT safety standards and would coordinate traffic control measures with the appropriate state/commonwealth and local agencies. For roads and trails on public lands, Atlantic and DETI would coordinate with the appropriate land managing agency regarding the timing of road and trail closures, detours to avoid active construction areas, and mitigation measures for maintaining access across the road, such as plating across the road. Where heavy equipment is known to use a road crossed by the pipeline, special safety measures, such as thicker-walled pipe or additional cover over the pipe, would be required. A list of road and trail crossings and the proposed construction method for each crossing is provided in appendix M.

2.3.3.9 Foreign Utilities

The pipelines would be constructed across or parallel to numerous utility lines. Prior to construction, Atlantic's and DETI's construction contractors would call the One-Call systems in each state/commonwealth, so that buried utilities may be identified and flagged before ground-disturbing activities. Where the pipeline is installed near a buried utility, Atlantic or DETI would install the pipeline with at least 12 inches of clearance from any other underground structure not associated with the pipeline as required by 49 CFR 192.325. Appendix N lists the known foreign utilities that would be crossed by ACP and SHP.

2.3.3.10 Winter Construction

ACP and SHP would involve construction during the winter. Therefore, Atlantic and DETI developed a *Winter Construction Plan* to address specialized construction methods and procedures that would be used to protect resources during the winter season (see table 2.3.1-1). Key elements of the *Winter Construction Plan* include: 1) a motor-grader, snowplow, or bulldozer would be fitted with a "shoe" to minimize impacts on the underlying soil and vegetation; 2) blown snow would be directed away from existing roads, driveways, parking areas, residences, or other landowner structures; 3) gaps would be left in stockpiled snow piles based on an assessment of drainage patterns to allow water to drain off of the right-of-way during the spring thaw or other warm periods; 4) backfilling and topsoil replacement would be suspended if infeasible due to frozen conditions; 5) snow would not be mixed with spoil during backfilling to the extent practicable; and 6) EIs would determine where additional erosion control devices should be installed to minimize snow melt erosion and would monitor the right-of-way for snow melt issues.

2.3.4 Aboveground Facility Construction

Construction and modification activities at the compressor station sites would include access road construction, erosion control installation, site clearing and grading, installing concrete foundations, erecting metal buildings, and installing compressors, metering facilities, and appurtenances. Initial work at the compressor stations would focus on preparing foundations for the buildings and equipment. Building foundations and pipe trenches would be excavated with standard construction earthmoving equipment. Atlantic and DETI do not anticipate that blasting would be required at compressor sites. Following foundation work, station equipment would be brought to the site and installed using any necessary trailers or cranes for delivery and installation. Compressor station buildings would be constructed while compressor equipment is installed, along with other primary facilities, associated equipment, piping, and electrical systems. Necessary equipment testing and start-up activities would take place on a concurrent basis.

Construction of the other proposed aboveground facilities, including the M&R stations, valves, and pig launchers/receivers, would involve site clearing and grading as needed to establish appropriate contours for the facilities. Following installation of the equipment, the sites would be graveled, as necessary, and fenced.

2.4 CONSTRUCTION SCHEDULE AND WORKFORCE

Atlantic and DETI propose a construction start date of fall 2017 and an in-service date during the fourth quarter of 2019. Atlantic and DETI would seek approval to begin construction as soon as possible after receiving all necessary federal, state/commonwealth, and local authorizations, and we issue the Notice(s) to Proceed with construction. Table 2.4-1 provides the currently anticipated construction schedule by construction spread.[7]

Construction of ACP would be completed using 12 construction spreads ranging in length from 1.4 miles to 79.3 miles. In addition, there would be separate specialized construction crews to construct the aboveground facilities. Section 4.9.2 details the estimated construction workforce for each construction phase of ACP and SHP. The peak construction workforce for ACP would be 8,400 people. The peak construction workforce for SHP would be 1,970 people. The total construction workforce would vary on any given day depending on the phase of construction, and would be distributed along the various construction spreads and aboveground facility sites. As the pipeline spread moves along, construction at any single point would last approximately 6 to 12 weeks or longer, depending upon the rate of progress, weather, terrain, and other factors. The duration of construction may be longer at aboveground facility sites and at hydrostatic test tie-in locations. Construction crews would typically work 10 hours per day, 6 days per week. Work would be conducted during daylight hours, except at stream crossings, final tie-in welds, and where the pipe is being installed using the HDD or bore methods, which require around-the-clock operations and typically last 24 hours to a few weeks or, for the proposed HDD crossing of the BRP and ANST, could take 1 year or longer.

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[7] Large pipeline construction projects are typically broken into manageable construction lengths called "spreads." Each spread is composed of various construction crews which specialize in completing the general construction procedures described in section 2.3.1. Establishing construction spreads allows multiple segments of the pipeline to be completed simultaneously, or certain spreads to be completed during preferred seasonal timeframes.

TABLE 2.4-1

Estimated Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate MPs	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
Atlantic Coast Pipeline				
Initial Construction Activities				
Initial Site Preparation (2018 spreads)	By spread	See below	November 2017	1Q 2018
Tree Clearing (2018 spreads) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (2019 spreads)	By spread	See below	September 2018	1Q 2019
Tree Clearing (2019 spreads) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline				
Spread 1-1 (AP-1)	0.0–17.2	Harrison, and Lewis Counties, WV	April 2019	4Q 2019
Spread 1-2 (AP-1)	17.2–31.6	Lewis and Upshur Counties, WV	April 2019	4Q 2019
Spread 2-1 (AP-1)[f]	31.6–47.3	Upshur and Randolph Counties, WV	April 2018	4Q 2018
Spread 2-2 (AP-1)[f]	47.3–56.1	Randolph County, WV	April 2018	4Q 2018
Spread 2A (AP-1)[f]	56.1–65.4	Randolph County, WV	April 2018	4Q 2018
Spread 3 (AP-1)[g]	65.4–79.2	Randolph and Pocahontas Counties, WV	April 2019	4Q 2019
Spread 3A (AP-1)[f, g]	79.2–91.3	Pocahontas County, WV and Highland County, VA	April 2018	4Q 2018
Spread 4 (AP-1)[g]	91.3–103.1	Highland and Bath Counties, VA	April 2019	4Q 2019
Spread 4A (AP-1)[f, g]	103.1–125.9	Bath and Augusta Counties, VA	April 2018	4Q 2018
Spread 5 (AP-1)[g, h]	125.9–183.3	Augusta and Nelson Counties, VA	February 2019	4Q 2019
Spread 6 (AP-1)[h]	183.3–239.6	Nelson, Buckingham, Cumberland, Prince Edward, and Nottoway Counties, VA	February 2018	4Q 2018
Spread 7 (AP-1)	239.6–300.0	Nottoway, Dinwiddie, Brunswick, and Greensville Counties, VA, and Northampton County, NC	February 2019	4Q 2019
Spread 8 (AP-2)	0.0–61.6	Northampton, Halifax, and Nash Counties, NC	February 2018	4Q 2018
Spread 9 (AP-2)	61.6–125.0	Nash, Wilson, Johnston, Sampson, and Cumberland Counties, NC	February 2019	4Q 2019
Spread 10 (AP-2)	125.0–183.0	Cumberland and Robeson Counties, NC	February 2018	4Q 2018
Spread 11 (AP-3)	0.0–83.0	Northampton County, NC, Greensville and Southampton Counties, VA, and the Cities of Suffolk and Chesapeake, VA	February 2018	4Q 2018
Spread 12 (AP-4; AP-5) [e]	0.0–0.4; 0.0–1.1	Brunswick County, VA; Greensville County, VA	February 2018	4Q 2018
Construction of Compressor Stations				
Compressor Station 1	7.6	Lewis County, WV	November 2017	4Q 2019
Compressor Station 2	191.5	Buckingham County, VA	November 2017	4Q 2019
Compressor Station 3	300.1	Northampton County, NC	November 2017	4Q 2019
Construction of Metering and Regulating Stations				
Kincheloe	7.6	Lewis County, WV	November 2017	4Q 2019
Long Run	47.2	Randolph County, WV	April 2018	4Q 2019

TABLE 2.4-1 (cont'd)

Estimated Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate MPs	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
Woods Corner	191.5	Buckingham County, VA	November 2017	4Q 2019
Smithfield	92.7	Johnston County, NC	November 2017	3Q 2019
Fayetteville	132.9	Johnston County, NC	February 2018	3Q 2019
Pembroke	183.0	Robeson County, NC	March 2018	3Q 2019
Elizabeth River	83.0	City of Chesapeake, VA	April 2018	3Q 2019
Brunswick	0.4	Brunswick County, VA	January 2018	3Q 2019
Greensville	1.1	Greensville County, VA	February 2018	3Q 2019
Supply Header Project				
Initial Construction Activities				
Initial Site Preparation (Spread 13)	By spread	See below	November 2017	1Q 2018
Tree Clearing (Spread 13) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (Spread 14)	By spread	See below	November 2018	1Q 2019
Tree Clearing (Spread 14) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline Spreads				
Spread 13 (TL-635)	0.0–33.6	Wetzel, Doddridge, Tyler, and Harrison Counties, WV	April 2018	4Q 2019
Spread 14 (TL-636)	0.0–3.9	Westmoreland County, PA	January 2019	4Q 2019
Construction of Compressor Station Modifications				
JB Tonkin	0.0	Westmoreland County, PA	February 2018	3Q 2019
Crayne	NA	Greene County, PA	February 2018	3Q 2019
Burch Ridge	NA	Marshall County, WV	April 2019	4Q 2019
Mockingbird Hill	0.0	Wetzel County, WV	February 2018	3Q 2019
M&R Stations				
CNX	NA	Lewis County, WV	January 2019	4Q 2019
Abandonment of Gathering Compressor Units				
Hastings	NA	Wetzel County, WV	January 2019	4Q 2019

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements.
[b] The start of tree clearing would be dependent upon the results of the environmental surveys and agency consultations.
[c] Including tree clearing for aboveground facilities, access roads, and contractor yards. Tree clearing for construction spreads 1-1, 1-2, 3, 4; the BRP HDD; and James River HDD would take place in 2018.
[d] The finish construction date refers to the end of mechanical construction; additional restoration and post-construction activity is expected to occur in the project area beyond the timeframe reflected here. 1Q = first quarter; 2Q = second quarter; 3Q = third quarter; 4Q = fourth quarter.
[e] Spread 12 would be completed with spread 11 and is counted as one spread.
[f] Hydrostatic testing and remaining cleanup would be completed by 3Q 2019.
[g] Includes NFS lands.
[h] The HDDs of the BRP (including the ANST) and James River would be constructed in 2018.

In response to our recommendation in the draft EIS, Atlantic consulted with the FS regarding the construction schedule for the portion of ACP on NFS lands and the proposed HDD under the BRP and ANST. In a letter dated April 4, 2017, the FS stated Atlantic had filed adequate documentation for the FS to determine the BRP/ANST HDD or contingency plan would be feasible. As such, the FS stated it would not prohibit construction activities on NFS lands before the proposed HDD crossing or contingency crossing of the BRP and ANST is successfully completed.

In its comments on the draft EIS, the FWS, FS, and individuals noted there are areas along the pipeline route where avoidance and conservation measures for a species or resource conflict with other avoidance or conservation measures (FWS, 2017f). As such, the FWS recommended that Atlantic and DETI create environmental constraints maps to identify the avoidance and conservation measures, including time of year restrictions (TOYR), that have been recommended for each pipeline segment. The FWS further recommended that the environmental constraints maps be provided to all the natural resource agencies for their review, to facilitate their ability to identify and prioritize conflicts between avoidance and conservation measures, and to subsequently provide that information to Atlantic, DETI, and permitting agencies for incorporation into the construction plans. We agree. **Therefore, we recommend that:**

- **<u>As part of Atlantic's and DETI's Implementation Plans (recommended Environmental Condition No. 6) and prior to receiving written authorization from the Director of the OEP to commence construction of any project facilities</u>, Atlantic and DETI should file with the Secretary environmental constraints maps illustrating the avoidance and conservation measures required by the resource agencies and committed to by Atlantic and DETI along the ACP and SHP routes. The environmental constraints maps can be provided in the form of alignment sheets (recommended Environmental Condition Nos. 4 and 5) with a separate environmental constraints band.**

2.5 ENVIRONMENTAL INSPECTION, COMPLIANCE MONITORING, AND POST-APPROVAL VARIANCES

2.5.1 Coordination and Training

Atlantic and DETI would incorporate the construction, mitigation, and restoration measures identified in their permit applications and supplemental filings as well as additional requirements of federal, state/commonwealth, and local agencies into their construction drawings and specifications. Atlantic and DETI would also provide copies of applicable environmental permits, construction drawings, and specifications to their construction contractors. Atlantic and DETI would implement an environmental training program tailored to the proposed projects and their construction requirements. The program would be designed to ensure that:

- qualified environmental training personnel provide thorough and focused training sessions throughout project construction regarding the environmental requirements applicable to the trainees' activities;
- all individuals receive environmental training before they begin work on any construction workspaces; and
- adequate training records are kept.

2.5.2 Environmental Inspection

Atlantic and DETI would employ EIs that would be trained in, and responsible to ensure that construction of ACP and SHP complies with the construction procedures and mitigation measures identified in Atlantic's and DETI's application, the FERC Certificates, other environmental permits and approvals, and environmental requirements in landowner easement agreements. EIs would have peer status with all of Atlantic's and DETI's other construction inspectors, have the authority to stop activities that violate the conditions of the FERC Certificates, other permits, or landowner requirements, and have the authority to order the appropriate corrective actions. The FERC staff acknowledges that the role of

Atlantic's and DETI's EIs is to ensure ACP and SHP is constructed in accordance with the requirements imposed by FERC and other regulatory agencies. However, the EI's role should not be mistaken for FERC abdicating its inspection authority to Atlantic and DETI. The purpose of the EI is to ensure applicants are cognizant of and taking matters of compliance seriously. Therefore, to ensure ACP and SHP would be constructed in compliance with the FERC's and other regulatory agencies' requirements, FERC would conduct its own independent monitoring and inspection of the projects as discussed in section 2.5.3. In addition, the FS would also conduct its own independent monitoring and inspection for the portion of ACP on NFS lands as discussed in section 2.5.4.

At a minimum, an EI would be responsible for:

- maintaining status reports and training records;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- identifying erosion/sediment control and stabilization needs in all areas;
- locating dewatering structures and slope breakers to ensure they would not direct water into sensitive areas such as known cultural resource sites or sensitive species habitat or violate permit requirements;
- verifying that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge in a wetland or waterbody. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent a reoccurrence;
- advising the Resident Engineer/Chief Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive soil rutting;
- approving imported soils; Atlantic and DETI do not currently propose to use imported soils;
- verifying that the soil is certified free of noxious weeds and soil pests;
- determining the need for and ensuring that erosion controls are properly installed to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads;
- inspecting and ensuring the maintenance and repair of temporary erosion control measures;
- ensuring restoration of contours and topsoil;
- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance; and
- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration.

The FERC would receive regular status reports filed by Atlantic and DETI, conduct periodic field inspections during construction and restoration, and would have the authority to stop any activity that violates an environmental condition of the FERC Certificate.

2.5.3 FERC Compliance Monitoring

In addition to the EIs, Atlantic and DETI would participate in a third-party compliance monitoring program during construction of ACP and SHP. Under this program, Atlantic and DETI would fund a third-party contractor, to be selected and managed by FERC staff, to provide daily environmental compliance monitoring services for the projects. The FERC third-party compliance monitors would provide daily reports to the FERC staff on compliance issues and make recommendations to the FERC Project Manager on how to deal with compliance issues and construction changes, should they arise. In addition to this program, FERC staff would also conduct periodic compliance inspections during construction and restoration of the projects. Other federal, state/commonwealth, and local agencies also may monitor the projects to the extent determined necessary by the agency. While there may be differences between agency permit requirements and conditions, the environmental inspection program and third-party monitoring for the projects would address all conditions placed on the projects.

2.5.4 Forest Service Compliance Monitoring

Monitoring is an essential element of project implementation. If the FS issues temporary and long-term authorizations for ACP, such authorization(s) would provide the terms and conditions for construction, operation, maintenance, and eventual termination of the facility on federal lands. As a federal agency with jurisdiction by law for activities that occur on lands it administers, the FS has a responsibility to monitor implementation of ACP to assure that the terms and conditions of the SUP(s) are carried out during and after construction (40 CFR 1505.3).

CEQ Regulations for NEPA (40 CFR 1505.2[c]) also require that a monitoring and enforcement program should be adopted for any project requirements adopted as part of the decision to implement the project. Many of the requirements of the *COM Plan* that would be part of the FS SUP on federal lands are project design measures that reduce the environmental impacts of ACP on site. The FS may also require an off-site mitigation program. In addition to monitoring implementation of the temporary and long-term SUPs, the FS also has a responsibility to monitor authorized actions, whether they are described in the *COM Plan* or off-site mitigation measures included in FS mitigation program. Section 3.0 of the draft *COM Plan* contains the *Environmental Compliance Plan* that would be the primary guidance document between Atlantic and the FS for adherence, documentation, and management for compliance with the SUPs. This section describes the roles and responsibilities of FERC, Atlantic, and the FS; a comprehensive inspection and monitoring program; corrective procedures in the event of non-compliance; standard protocol for variance requests, exceptions, and other deviations; communications; and reporting procedures. The FS would have an Authorized Officer who would have responsibility for determining overall environmental compliance with the *COM Plan*, ROD, and terms of the SUPs. The Authorized Officer would have stop work authority on all NFS lands. The Authorized Officer would manage the Field Compliance/Monitoring Officers and would also be responsible for issuing Notices to Proceed and for approving requested project changes on NFS lands using the variance request process. The Field Compliance/Monitoring Officers would have Stop Work authority for discrete activities on NFS lands that pose an immediate threat to a sensitive environmental resource.

There are two types of monitoring that would be associated with administering the SUP. "Implementation monitoring" seeks to verify that the project was implemented according to the terms of the SUP. Implementation monitoring is typically a checklist to verify that a project is implemented as planned and that requirements, terms, and conditions associated with the project are met. Many of these would also be addressed by the FERC in its construction monitoring and inspection processes. As needed for ACP, FS representatives would also ensure that its priorities and stipulations are accomplished and obligations are fulfilled. In addition, the FS would have its own inspectors on site, who would coordinate with FERC monitors and ACP inspectors, and would also have stop-work authority on NFS lands.

"Effectiveness monitoring" seeks to verify that the specific requirements in the *COM Plan* and in the off-site mitigation plans accomplished the desired objective. While virtually every important aspect of ACP is subject to implementation monitoring, effectiveness monitoring is typically done on a smaller subset of actions. Where the outcomes of an action are well known and likely to be accomplished merely through implementation, effectiveness monitoring may not be needed, or may only be done on a sample basis. For example, the effects of surfacing roads are well known and not in question, so little if any effectiveness monitoring would be required for this activity. Conversely, some *COM Plan* requirements or mitigation projects may have less certain outcomes or may be associated with thresholds such as water temperature. In those cases, effectiveness monitoring would be appropriate to ensure that the desired outcome is achieved. This also provides a trigger for adaptive management if the implemented mitigation is not entirely effective. Effectiveness monitoring requires interpretation of land management plan direction and objectives. Therefore, most effectiveness monitoring on federal lands would be accomplished by the agency having jurisdiction over the land being monitored.

Reporting results is a key element of a monitoring plan. The monitoring plan developed by the FS would include a reporting schedule and detailed criteria for judging completion and success of the actions being monitored. Implementation monitoring would typically be deemed complete when the action being monitored has been completely implemented. Effectiveness monitoring would not be complete until the project objectives have been accomplished and, on NFS lands, could occur in perpetuity, for the life of the project.

The draft *COM Plan* developed by Atlantic is part of the special use application and permit and includes extensive monitoring requirements to ensure that impacts from construction and operation of ACP are minimized and that objectives of the FS are accomplished. Ongoing discussions between Atlantic and the FS are expected to result in revisions to the *COM Plan*.

2.5.5 Post-Approval Variance Process

The pipeline alignment and work areas identified in this EIS should be sufficient for construction and operation (including maintenance) of the projects. However, minor route realignments and other workspace refinements sometimes continue past the project planning phase and into the construction phase. These changes could involve minor route realignments, shifting or adding new extra workspaces or staging areas, adding or improving additional access roads, or modifications to construction methods. We have developed a variance procedure for assessing impacts on those areas that have not been evaluated in this EIS and for approving or denying their use following any Certificate issuance. In general, biological and cultural resources surveys were conducted using a survey corridor larger than that necessary to construct the facilities. Where survey approvals were denied, Atlantic and DETI would complete the required surveys following a Certificate issuance. If Atlantic and DETI request to shift an existing workspace or require a new extra workspace subsequent to issuance of a Certificate, these areas would typically (but not always) be within the previously surveyed area. Such requests would be reviewed using a variance request process.

A variance request for route realignments or extra workspace locations along with a copy of the survey results would be documented and forwarded to the FERC in the form of a "variance request" in compliance with recommended condition number 5 in section 5.2 of this EIS. The FERC would take the lead on reviewing the request and coordinating with the FS if the variance is requested on NFS lands. Typically, no further resource agency consultation would be required if the requested change is within previously surveyed areas, within authorized rights-of-way, and no sensitive environmental resources would be affected. However, for all variances on NFS lands that are not specifically authorized by the originally issued SUPs, the FS would still retain approval authority. The procedures used for assessing impacts on work areas outside the survey corridor and for approving their use are similar to those described above, except that additional surveys, analyses, and resource agency consultations would be performed to assess the extent of any impacts on biological, cultural, and other sensitive resources and to identify any avoidance, minimization, and mitigation measures necessary. All variance requests for Atlantic's and DETI's projects and their approval status would be documented according to the FERC's compliance monitoring program as described above. Any variance activity by either Atlantic or DETI (whether submitted through the third-party compliance monitoring program or directly to FERC) and subsequent FERC action would be available on the FERC's eLibrary webpage under the docket number for the respective project (CP15-554 or CP15-555).

After Atlantic and DETI complete any additional surveys, landowner consultation, analyses, and/or resource agency consultations, the new work area and supporting documentation (including a statement of landowner approval) would be forwarded to the FERC in the form of a variance request, which would be evaluated in the manner described above for approval or denial.

2.5.6 Post-Construction Monitoring

After construction, Atlantic and DETI would conduct follow-up inspections of all disturbed upland areas, at a minimum, after the first and second growing seasons to determine the success of restoration, and would continue monitoring areas until revegetation thresholds are met, temporary erosion control devices are removed, and restoration is deemed successful. Restoration of upland areas would be considered successful if the right-of-way vegetation is visually successful in density and cover of non-nuisance vegetation, surface conditions are similar to adjacent undisturbed lands, construction debris is removed, and proper drainage has been restored. Additionally, on NFS lands, successful restoration of uplands includes revegetation with native tree, shrub, and herbaceous species, and control and removal of non-native, invasive plant species. For at least 2 years following construction, Atlantic and DETI would submit quarterly reports to the FERC that document any problems identified during the inspections or by landowners, and describe the corrective actions taken to remedy those problems. We would also conduct periodic restoration inspections until restoration is deemed complete. Additionally, Atlantic and DETI would perform monitoring for invasive plant species following construction. The monitoring period for invasive species and other resource areas would be extended as needed or as required by permits or regulatory agencies.

In accordance with the *Procedures*, Atlantic and DETI would monitor the success of wetland revegetation annually for the first 3 years (or as required by permit) after construction or until wetland restoration is successful. Wetland revegetation would be considered successful when the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent undisturbed wetland areas or as compared to documented, pre-project conditions. In accordance with the FERC *Procedures*, if revegetation is not successful at the end of 3 years, Atlantic or DETI would develop and implement (in consultation with a professional wetland ecologist) a plan to actively revegetate and restore the wetland with native wetland herbaceous and/or woody plant species.

After construction, the FERC, cooperating agencies, and/or other agencies would continue to conduct oversight inspection and monitoring to assess the success of restoration. If it is determined that the success of any of the restoration activities are not adequate at the end of the respective timeframes, Atlantic and DETI would be required to extend their post-construction monitoring programs and implement corrective actions as deemed necessary.

Other land and resource management agencies may conduct their own restoration inspections in areas where they have jurisdiction. For example, the FS would require monitoring of invasive species, revegetation, slope stability, sedimentation/erosion, and other environmental resources and impacts on NFS lands for the life of the project.

We recognize that during and after construction, unforeseen issues or complaints may develop that were not addressed during the environmental proceedings at the Commission, and it is important that landowners have an avenue to contact Atlantic's or DETI's representatives. Should ACP and SHP be approved, we are interested in ensuring that landowner issues and complaints received during and after construction are resolved in a timely and efficient manner. Resolution of landowner issues and complaints are discussed further in section 4.8.3.

2.6 OPERATION AND MAINTENANCE

ACP and SHP pipeline and aboveground facilities would be operated and maintained in accordance with DOT regulations in 49 CFR 192, the Commission's guidance at 18 CFR 380.15, the FS SUP, and the maintenance provisions of the FERC *Plan* and *Procedures*. Atlantic and DETI would also maintain a liaison with the appropriate fire, police, and public officials. Communications with these parties would include the potential hazards associated with the Atlantic's and DETI's facilities located in their service area and prevention measures undertaken; the types of emergencies that may occur on or near the new pipeline facilities; the purpose of pipeline markers and the information contained on them; pipeline location information; recognition of and response to pipeline emergencies; and procedures to contact Atlantic and/or DETI for more information.

2.6.1 Pipeline Facility Operation and Maintenance

As required by 49 CFR 192.615, Atlantic and DETI would each establish an operation and maintenance plan and an emergency plan for their respective projects that includes procedures to minimize the hazards in a natural gas pipeline emergency. As a part of pipeline operations and maintenance, Atlantic and DETI would conduct regular patrols of the pipeline right-of-way. The patrol program would include periodic aerial and ground patrols of the pipeline facilities to survey surface conditions on and adjacent to the pipeline right-of-way for evidence of leaks, unauthorized excavation activities, erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices, exposed pipe, missing markers and signs, new residential developments, and other conditions that might affect the safety or operation of the pipeline. The cathodic protection system would also be inspected periodically to ensure that it is functioning properly. Atlantic's and DETI's management staffs would be notified by its inspectors of any conditions that need attention and corrective measures would be performed as needed. In addition, pigs would be regularly sent through the pipeline to check for corrosion and irregularities in accordance with DOT requirements. Atlantic and DETI would be required to keep detailed records of all inspections and supplement the corrosion protection system as necessary to meet the requirements of 49 CFR 192.

In addition to the survey, inspection, and repair activities described above, operation of the pipeline would include maintenance of the pipeline right-of-way. The right-of-way would be allowed to revegetate after restoration; however, larger shrubs and brush may be periodically removed near the pipeline. The frequency of the vegetation maintenance would depend upon the vegetation growth rate. Atlantic and DETI have indicated that they would not need to maintain vegetation (i.e., mow) within the permanent right-of-way in most land uses types. However, in accordance with the construction and restoration plans, routine vegetation maintenance clearing of the permanent right-of-way is allowed but would not be done more frequently than every 3 years. To facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained more frequently in an herbaceous state. In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year; other TOYR require longer seasonal restrictions. Vegetation management and right-of-way maintenance is discussed further in sections 4.3.3, 4.4, and 4.8.

2.6.2 Aboveground Facility Operation and Maintenance

Atlantic and DETI would continue to operate and maintain the modified and new compressor stations in accordance with PHMSA requirements and standard procedures designed to ensure the integrity and safe operation of the facilities and to maintain firm natural gas transportation service. Standard operations at compressor stations include such activities as the calibration, maintenance, and inspection of equipment; the monitoring of pressure, temperature, and vibration data; and traditional landscape maintenance such as mowing and the application of fertilizer. Standard operations also include the periodic checking of safety and emergency equipment and cathodic protection systems.

Atlantic and DETI would install a supervisory control and data acquisition system, commonly referred to as Supervisory Control and Data Acquisition (SCADA), on each pipeline system, which would continuously monitor gas pressure, temperature, and volume at specific locations along the pipeline. These systems would be continuously monitored from gas control centers. The systems would provide continuous information to the control center operators and have threshold and alarm values set such that warnings are provided to the operators if critical parameters are exceeded. In the event of a drop in pressure within a pipeline, the gas control center would be immediately alerted and could stop the gas flow to the problem area by selectively isolating sections of the pipeline via valves until inspections are completed to determine the cause of the problem and complete repairs.

2.7 FUTURE PLANS AND ABANDONMENT

ACP Foundation Shippers have a one-time right to request an increase in contracted capacity by participation in an Optional Expansion totaling up to 500,000 dekatherms per day (Dth/d). If the Foundation Shippers were to pursue the Optional Expansion, Atlantic anticipates that it could be accommodated by installing additional compression on the ACP system without the addition of new mainline pipeline facilities. Any future increase in capacity beyond the proposed 1.5 Dth/d requested in this proceeding would need additional FERC authorization (which would also require additional environmental review).

ACP Foundation Shippers also have a stated right to request a Second Expansion. If the facilities are expanded in the future, including an expansion as part of the Optional Expansion or the Second Expansion, Atlantic and/or DETI would seek the appropriate authorizations from federal (including FERC), state/commonwealth, and local agencies at that future time.

If at some point in the future, any of the project facilities approved in this proceeding were proposed to be abandoned, Atlantic and/or DETI would have to seek specific authorization from the FERC for that action and the public would have the opportunity to comment on the applicant's abandonment proposal.

2.8 NONJURISDICTIONAL FACILITIES

Under section 7 of the NGA, the FERC is required to consider, as part of its decision to authorize interstate natural gas facilities, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the FERC. These "nonjurisdictional" facilities may be integral to the project objective (e.g., a new or expanded power plant that is not under the jurisdiction of the FERC at the end of a pipeline) or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated with the proposed facilities (e.g., a meter station constructed by a customer of the pipeline to measure gas off-take).

The nonjurisdictional facilities associated with ACP and SHP are summarized in table 2.8-1. We discuss these facilities in section 4.13.

TABLE 2.8-1

Nonjurisdictional Facilities Associated with the Atlantic Coast Pipeline and Supply Header Project

Project Sponsor/Name	Location	Description
Dominion Virginia Power		
Brunswick Power Station	Brunswick County, Virginia	The Brunswick Power Station, a 1,358-megawatt, natural gas fueled power station and associated transmission facilities and a 13.5-mile-long 500 kilowatt electric transmission line (construction completed).
Greensville Power Station	Greensville County, Virginia	The Greensville Power Station, an approximately 1,600-megawatt, natural gas fueled power station (under construction).
Piedmont Natural Gas		
Piedmont Facility Modifications and Additions	Wake, Johnson, Cumberland, Robeson, and Richmond Counties, North Carolina	Modifications and additions at existing facilities (proposed).
Piedmont Pipeline	Robeson, Scotland, and Richmond Counties, North Carolina	Approximately 26 miles of 30-inch outside diameter natural gas pipeline (proposed).
Virginia Natural Gas, Inc.		
Virginia Natural Gas Pipeline	City of Chesapeake, Virginia	Approximately 5 miles of 20-inch outside diameter natural gas pipeline (proposed).
Atlantic Coast Pipeline		
ACP Office Building	Northampton County, North Carolina	An office building for ACP operations within the Compressor Station 3 site (proposed).
ACP Field Office Building	Johnston County, North Carolina	A field office building for ACP operations within the Smithfield M&R Station site (proposed).
ACP Utility, Sewer, and Water Services for Aboveground Facilities	Various Counties and Cities in West Virginia, Virginia, and North Carolina	Utility, water, and sewer service to ACP aboveground facilities; modifications to existing natural gas gathering facilities; and upgrade of an existing road (proposed).
Dominion Transmission		
Hastings Compressor Station	Wetzel County, West Virginia	Two new gathering compressor units at the Hastings Compressor Station for gathering activities (proposed).
Mockingbird Hill Compressor Station	Wetzel County, West Virginia	About 0.2 mile of electric distribution line.

3.0 ALTERNATIVES

As required by NEPA, FERC policy, and CWA 404(b)(1) guidelines, and in cooperation with the FS and USACE, we identified and evaluated alternatives to ACP and SHP to determine whether an alternative would be technically and economically feasible, offer a significant environmental advantage over the proposed action, and would still meet the stated purpose of the proposed action. Specifically, we evaluated the no-action alternative, system alternatives, major pipeline route alternatives and route variations, and aboveground facility location alternatives.

Evaluation Process

Our evaluation of the identified alternatives is based on project-specific information provided by Atlantic and DETI, affected landowners, and other concerned parties; comments received during project scoping; publicly available information; our consultations with federal and state resource agencies; our own independent fieldwork; and our expertise and experience regarding the siting, construction, and operation of natural gas transmission facilities and their potential impacts on the environment. We established three key criteria to evaluate the identified alternatives, which included whether the alternative would:

- be technically and economically feasible and practical;
- offer a significant environmental advantage over the proposed action; and
- meet the projects' purpose, as described in section 1.1.

Through environmental comparison and application of our professional judgement, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. To ensure a consistent environmental comparison and to normalize the comparison factors, we generally use desktop sources of information (e.g., publicly available data, GIS data, aerial imagery) and assume the same right-of-way widths and general workspace requirements. Where appropriate, we also use site-specific information (e.g., field surveys or detailed designs), and consult with appropriate resource or land managing agencies to obtain additional site-specific information and their professional judgement regarding alternatives. As described previously, our environmental analysis and this evaluation only considers quantitative data (e.g., acreage or mileage) and uses common comparative factors such as total length, amount of collocation, and land requirements. Our evaluation also considers impacts on both the natural and human environments. Impacts on the natural environment include wetlands, forested lands, karst geology, and other common environmental resources. Impacts on the human environment include but are not limited to impacts on residences, roads, utilities, certain land uses, and industrial and commercial development near construction workspaces. In recognition of the competing interests and the different nature of impacts resulting from an alternative that sometimes exist (i.e., impacts on the natural environment versus impacts on the human environment), we also consider other factors that are relevant to a particular alternative or discount or eliminate factors that are not relevant or may have less weight or significance.

With respect to the first criterion, it is important to recognize that not all conceivable alternatives are technically feasible and practical. For example, some alternatives may not be possible to implement due to technological difficulties or logistics. We do not design natural gas pipeline projects. Rather, pipeline companies propose and design pipeline projects in response to market conditions. In turn, we analyze these proposals and a reasonable range of alternatives. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the added cost to design, permit, and construct the alternative would render the project economically impractical.

Determining if an alternative provides a significant environmental advantage requires a comparison of the impacts on each resource as well as an analysis of impacts on resources that are not common to the alternatives being considered. The determination must then balance the overall impacts and all other relevant considerations. In comparing the impact between resources (factors), we also considered the degree of impact anticipated on each resource. Ultimately, an alternative that results in equal or minor advantages in terms of environmental impact would not compel us to shift the impacts from the current set of landowners to a new set of landowners. In conducting this analysis, it is important to recognize the environmental advantages and disadvantages of the proposed actions to focus the analysis on reasonable alternatives that may reduce impacts and offer a significant environmental advantage.

A preferable alternative must meet the stated purpose of the projects, which is to provide transportation of 1.44 million Bcf/d of natural gas to consuming markets at the delivery points specified by the projects' customers. A preferable alternative also would need to provide service within a reasonably similar timeframe. It is important to recognize that not all conceivable alternatives can meet the projects' purpose, and an alternative that does not meet the projects' purpose cannot be considered a viable alternative.

Using the evaluation criteria discussed above, each alternative was considered to the point where it was clear that the alternative was either not reasonable, would result in greater environmental impacts that could not be readily mitigated, offered no significant environmental advantages over the proposed projects, or could not meet the projects' purpose. Alternatives that appeared to result in less than or similar levels of environmental impact were reviewed in greater detail. The following sections discuss and analyze alternatives that warranted further review and provide sufficient detail to explain why they were eliminated from further consideration or are recommended for adoption into the respective project.

Public Comments

In evaluating alternatives, we considered and addressed, as appropriate, the numerous comments provided to the Commission about possible alternatives. Many of these comments requested that we evaluate alternatives to the proposed pipeline routes, the aboveground facility locations, or to eliminate or merge the proposed ACP and SHP with similar natural gas transportation projects that are currently proposed in the region. In response to these comments, we required Atlantic and DETI to provide additional environmental information, requested they assess the feasibility of certain alternatives as proposed by the commentors, conducted site visits and field investigations, met with affected landowners and local representatives and officials, consulted with federal and state regulatory agencies, and sought additional public input. These efforts, along with Atlantic's and DETI's continued assessment of their respective projects, resulted in numerous re-routings and facility design changes, which are summarized in the following sections. The alternatives and variations already incorporated by Atlantic and DETI into their proposed routes are included as part of our environmental analysis in section 4.0.

The Commission also received numerous comments suggesting that the electricity and power generated from natural gas could be generated and supplied by renewable energy sources such as solar and wind power, and that the use of these energy sources as well as gains realized from increased energy efficiency and conservation should be considered as alternatives to the projects. As stated in section 1.1, the purpose of ACP and SHP is to transport price-competitive natural gas from West Virginia to electric generation, distribution, and end use markets in West Virginia, Virginia, and North Carolina. The generation of electricity from renewable energy sources is a reasonable alternative for a review of power generating facilities. Authorizations related to how the project area would meet demands for electricity are not part of the application before the Commission and their consideration is outside the scope of this EIS. Therefore, because the purpose of ACP and SHP is to transport natural gas, and the generation of electricity from renewable energy sources or the gains realized from increased energy efficiency and conservation are not transportation alternatives, they cannot function as a substitute for ACP and SHP and are not considered or evaluated further in this analysis.

3.1 NO-ACTION ALTERNATIVE

The Commission has two courses of action in processing applications under section 7 of the NGA: 1) deny the requested actions (the no-action alternative); or 2) grant the Certificate, with or without conditions. If the no-action alternative is selected by the Commission, the proposed facilities would not be constructed, and the short- and long-term environmental impacts from the projects would not occur. In addition, if the no-action alternative is selected, the stated purpose of projects would not be met. The no-action alternative would eliminate the proposed natural gas supply for West Virginia, Virginia, and North Carolina markets, causing existing and potential users of natural gas to either pursue other means of natural gas supply, to rely on other fuels, or to seek other means to meet or curtail their energy needs.

According to the EIA, consumption of natural gas grew by 12 and 49 percent, respectively, in Virginia and North Carolina between 2010 and 2014. Gas-fired electric power generation was the leading contributor to increased gas consumption, increasing by 71 and 199 percent, respectively, in Virginia and North Carolina between 2011 and 2015 (EIA, 2016b, 2016c). Natural gas consumption is projected to continue increasing due to population growth, industrial consumption, and electric power generation (EIA, 2016a).

The lack of a new pipeline with access to supply sources into the region could prolong the existing supply constraints in the proposed delivery areas, which could create winter-premium pricing and exacerbate price volatility for all natural gas users in the areas, and could increase the difficulty for others, such as the operators of gas-fired electric generating plants, in finding economical gas supplies. This in turn could lead to higher gas and electric rates in the region and could lead to energy shortages during times of winter peak demand.

The burning of natural gas at power plants to produce electricity also results in reduced air emissions compared to other fossil fuels, such as coal and fuel oil. According to the EPA (2013a), natural gas produces at least 50 percent less carbon dioxide (CO_2), almost 70 percent less nitrogen oxides (NO_x), and about 99 percent less sulfur oxides (SO_x) compared to a coal-fired power plant. Since the 1990s, the transition to natural gas fueled power plants has substantially decreased dependence upon the formerly pre-dominant energy sources of fuel oil, coal, and nuclear energy. If the no-action alternative were adopted, then air emissions could be increased if other sources of energy were used.

The no-action alternative would not provide the potential economic benefits associated with the proposed projects, including increased jobs, secondary spending, and tax revenues during construction, as well as increased property tax revenues to local governments during operations as discussed in section 4.9.8. Further, the no-action alternative would not provide natural gas service to end-use customers in Virginia and North Carolina. The abovementioned transition in energy sources to generate electricity has been hastened by the relative lower cost of natural gas, which has economic and cost savings benefits that are then passed along to consumers of electricity.

In summary, the no-action alternative would avoid the environmental impacts of the proposed projects, but would likely result in the need for an alternate energy means to satisfy the demand for natural gas and energy in the project area, or would result in end users seeking alternate energy from other sources such as other natural gas transporters, fossil fuels, or renewable energy. Given consideration of these factors, we conclude that the no-action alternative is not preferable to ACP and/or SHP and we do not recommend it.

3.2 SYSTEM ALTERNATIVES

The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the proposed facilities could be avoided or reduced while still meeting the basic purpose of the projects. System alternatives would make use of existing, modified, or other proposed natural gas transmission systems/facilities to meet the stated purpose of ACP and SHP. Implementation of a system alternative would make it unnecessary to construct all or part of the projects, although some modifications or additions to existing transmission systems/facilities, or other proposed transmission systems or facilities, may be required.

A viable system alternative to the projects would have to provide sufficient pipeline capacity to transport an additional 1.44 Bcf/d of natural gas to the delivery points specified by the precedent agreements signed by Atlantic and DETI within a timeframe reasonably similar to the proposed projects. Additionally, the system alternative must be technically and economically practical and offer a significant environmental advantage over the proposed projects. Our analysis of system alternatives includes an examination of existing and proposed natural gas transportation systems that currently serve or eventually would serve the markets targeted by the projects.

3.2.1 Existing Pipeline Systems

There are currently three existing natural gas pipeline transportation systems operating near the proposed project area: the Transco pipeline system, the Columbia Gas Transmission, LLC (Columbia) system, and the East Tennessee Natural Gas (East Tennessee) pipeline system. These pipelines currently do not have the available capacity to transport the required volumes of natural gas to the delivery points proposed for ACP and SHP, nor do these existing facilities have the necessary infrastructure to transport gas to the required delivery points. Even if additional pipelines were constructed to connect any of these pipeline systems to the supply and delivery areas for ACP, there still is not sufficient capacity on any of the existing pipeline systems to transport 1.44 Bcf/d of natural gas. Therefore, we do not consider use of existing pipeline systems as is, as feasible alternatives to the proposed projects.

3.2.2 Modification of Existing Pipeline Systems

Because none of the existing pipeline systems in the project area have the capacity to meet the projects' purpose in their current state, they would require modifications to meet the projects' purpose. These modifications could include greenfield pipeline construction to connect to the supply area, delivery area, or both; the use of existing pipeline where possible along with looped pipeline (i.e., new pipeline construction generally adjacent to an existing pipeline); additional compression; or some combination of these options.

3.2.2.1 Existing Transco Pipeline System

The existing Transco system consists of various diameter pipelines extending some 10,200 miles between Texas and New York, including through Virginia. The system has a peak design capacity of almost 11 Bcf/d of natural gas and delivers natural gas to markets in the Northeast, Mid-Atlantic, and Southeast region of the United States. To meet the purpose of ACP and SHP using the Transco Pipeline system, significant modifications would be necessary. Up to 300 miles of new pipeline and compressor station modifications would be required to connect supply areas to the Transco mainline. Additional upgrade of the Transco mainline, including new compression and looping, would be necessary to increase capacity and accommodate the volume of natural gas required for ACP. Construction of new mainline or lateral pipelines would also be necessary to reach the same delivery points as ACP in southeastern Virginia (approximately 160 miles) and North Carolina (approximately 180 to 200 miles). The environmental impacts associated with these upgrades and new pipeline construction for the Transco system (a combined total of 640 to 680 miles of new pipeline) would likely be similar to the impacts of ACP and SHP, and we have not identified or received any information that suggests the alternative would provide a significant environmental advantage over ACP and SHP. Additionally, these modifications could not occur within a similar timeframe as the proposed projects. For this reason, and the fact that the existing system does not meet ACP's project purpose, modifications to the existing Transco system are not considered a viable system alternative.

3.2.2.2 Existing Columbia Gas Transmission System

The existing Columbia system delivers natural gas from supply areas in the Appalachian basin to demand areas in southern Virginia, including the City of Chesapeake. The Columbia system has a capacity to transport of an average of about 3 Bcf/d of natural gas. The FERC staff has determined that this capacity is currently contracted as evidenced by Columbia's own proposal for expansion in the area as described in FERC Docket CP16-38 (WB XPress Project). Like the Transco scenario above, significant modifications to the Columbia pipeline system would be necessary to meet the purpose of ACP and SHP. Similar pipeline and compressor station modifications as those of SHP would be required to connect supply areas to the Columbia pipeline system. About 400 miles of new pipeline loop would be required to reach the proposed ACP delivery points in southern Virginia. Additional new pipeline construction would also be required to reach the delivery points in North Carolina, much of which could be similar to the proposed AP-2 mainline for ACP. The environmental impacts associated with construction of these facilities would likely be similar to or greater than those of ACP, and we have not identified or received any information that suggests the alternative would provide a significant environmental advantage over ACP and SHP. For this reason, and the fact that the current system does not meet ACP's purpose and need, modification of the Columbia pipeline system is not considered a viable alternative to ACP and SHP.

3.2.2.3 Existing East Tennessee Natural Gas System

The East Tennessee pipeline system has the capacity to transport almost 1.9 Bcf/d of natural gas and extends from western Tennessee to central and southern Virginia and northern North Carolina, where it interconnects with the Transco pipeline system. The FERC staff has determined that this capacity is currently contracted, and the addition of 1.44 Bcf/d would result in looping, new pipeline construction, and new compression along the East Tennessee pipeline system. New pipeline construction would be required to access the same supply areas as ACP (150 to 180 miles), and provide access to the same delivery points as ACP in southern Virginia (210 to 230 miles) and North Carolina (190 to 210 miles). The environmental impacts associated with the system upgrades and new pipeline construction (a minimum of between 550 and 620 miles of new pipeline) would likely be similar to or greater than those of ACP, and we have not identified or received any information that suggests the alternative would provide a significant environmental advantage over ACP and SHP. For this reason, and the fact that the current system does not meet ACP's purpose and need, modification of the existing East Tennessee system is not considered a viable alternative to ACP and SHP.

3.2.3 Proposed Pipeline Projects

In addition to modifying existing pipeline systems, we considered the potential to make use of or modify proposed natural gas pipeline transmission projects in the project area to meet the purpose and need of ACP and SHP. There are currently two, viable, major natural gas transportation projects proposed in the general vicinity of ACP and SHP: MVP and the WB XPress Project. An evaluation of the potential for these projects to meet the purpose of ACP and SHP is provided in the following subsections.

3.2.3.1 Proposed WB XPress Project

Columbia is proposing to construct and operate about 29 miles of various diameter pipelines in multiple segments, modifications at seven existing compressor stations, and construction of two new compressor stations, in West Virginia and Virginia. This WB XPress Project would enable Columbia to increase gas transportation services to a major local distribution company and increase deliveries to third-party interstate pipelines. The longest single pipeline segment would be 25.4 miles of 26-inch-diameter replacement pipeline in Randolph and Pendleton Counties, West Virginia. Most of the new pipeline segments would be constructed adjacent to Columbia's existing WB pipeline. The WB XPress Project would deliver up to 1.3 Bcf/d of natural gas and is currently under review by the FERC under Docket No. CP16-38-000.

The WB XPress Project does not align with the delivery and receipt points of ACP and SHP and would not have sufficient capacity to deliver the contracted volume of natural gas (2.74 Bcf/d) for both ACP/SHP and WB Xpress customers. Therefore, we conclude the WB XPress Project is not a viable alternative to ACP and SHP.

3.2.3.2 Proposed Mountain Valley Pipeline and Equitrans Expansion Projects

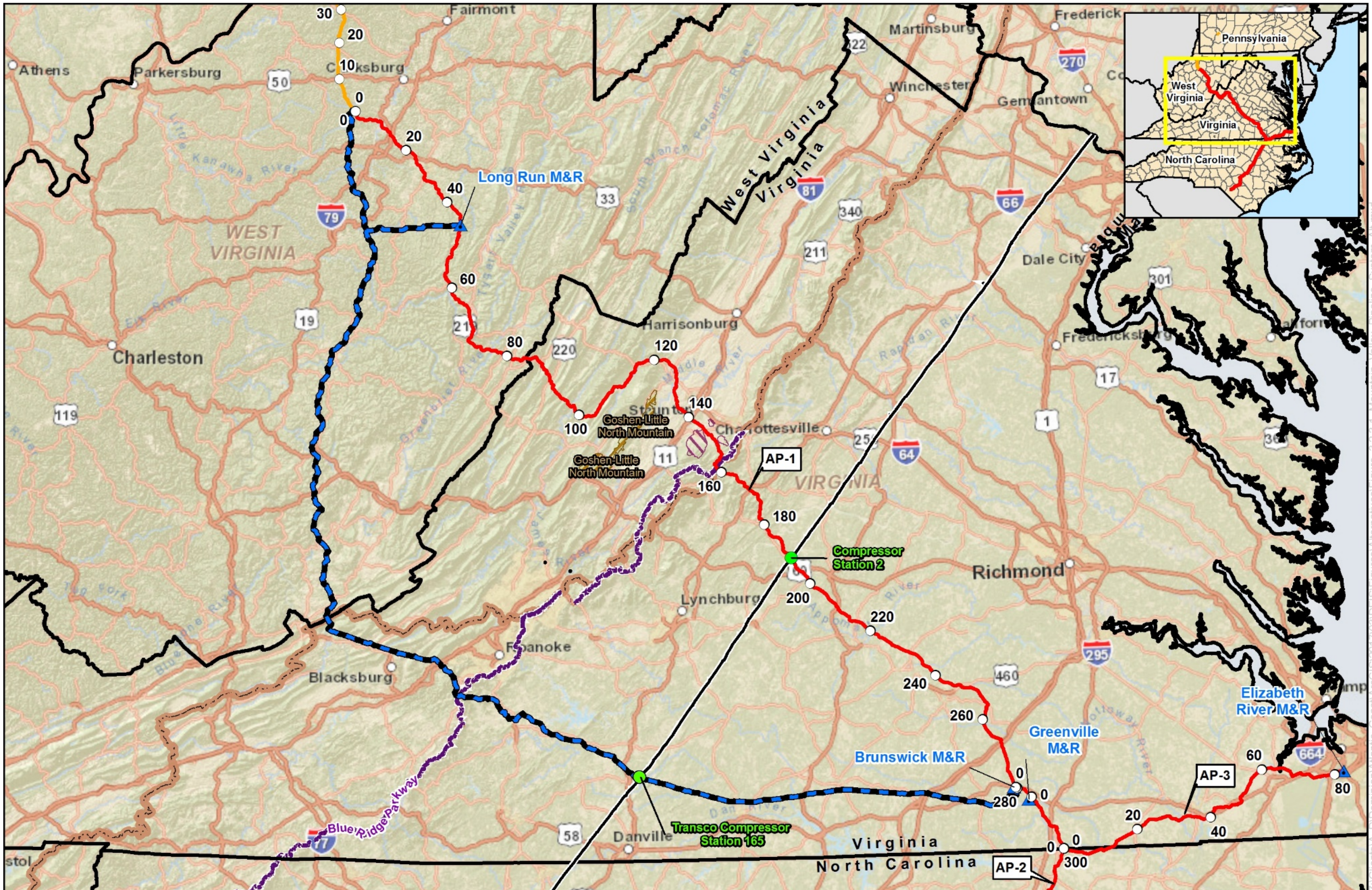
Mountain Valley Pipeline, LLC (Mountain Valley) proposes to construct and operate about 301 miles of 42-inch-diameter pipeline from Wetzel County, West Virginia to an interconnection with the existing Transco pipeline system in Pittsylvania County, Virginia. This project, known as MVP, would deliver up to 2 Bcf/d of natural gas to different end-users connected to the Transco system, including local distribution companies, industrial users, and power generation facilities in the Appalachian, Mid-Atlantic, and Southeast regions. MVP is currently under review by the FERC under Docket No. CP16-10-000.

To support MVP, Equitrans, L.P. (Equitrans) is proposing to construct and operate about 7.9 miles of pipeline that would connect with MVP at the Webster Interconnect and Mobley Tap in Wetzel County, West Virginia. This project, known as the Equitrans Expansion Project (EEP), proposes facilities with a design capacity of 600,000 Dth/d. The EEP is currently under review by the FERC under Docket No. CP16-13-000. Because MVP and EEP are interrelated, the FERC is analyzing both together in one joint EIS. The draft EIS for MVP and EEP was issued on September 16, 2016, under FERC Accession No. 20160916-4001. While MVP and EEP would originate from the same region as ACP and SHP, each project would serve different customers and end-use markets.

To meet the same objective as ACP and SHP, MVP/EEP would need to be expanded to provide an additional 1.44 Bcf/d of natural gas and reach ACP delivery points in West Virginia, Virginia, and North Carolina. This objective could conceptually be accomplished by either merging ACP and MVP into one pipeline system or collocating the pipelines along similar routes. Merging of ACP with the proposed MVP is analyzed below, while collocating ACP along MVP route is analyzed in section 3.3.1. FERC staff also analyzed the potential for MVP to be merged with or collocated along ACP route in the MVP/EEP draft EIS.

MVP Merged Systems Alternative

This system alternative would primarily follow the proposed MVP route and would require the capacity of both MVP and ACP, a total of approximately 3.44 Bcf/d, to be transported through one large diameter pipeline to Transco's existing Compressor Station 165 in Pittsylvania County, Virginia. At this delivery point, the alternative would continue to ACP delivery points in Virginia and North Carolina as shown on figure 3.2.3-1.



0 15 30 Miles

N W E S

For Environmental Review Purposes Only

Figure 3.2.3-1
Mountain Valley Pipeline System Alternative
Atlantic Coast Pipeline and Supply Header Project

Milepost
Compressor Station
M and R Station
SHP Proposed Route
ACP Proposed Route
Mountain Valley Pipeline System Alternative (369.9 miles)
Transco Pipeline System

Source: Z:\Clients\A_D\Dominion\Atlantic_Coast\ArcGIS\2017\03\DEIS\Figures\Alternatives\Figure_3.2.3-1_Mountain_Valley_Pipeline_System_Alt.mxd
Date: (5/9/2017)

To meet the delivery requirements of both ACP and MVP, the following pipeline segments would need to be constructed:

- 3.9 miles of 30-inch-diameter pipeline in Westmoreland County, Pennsylvania (i.e., the TL-636 loopline, which is part of the proposed SHP);
- about 7 miles of 30-inch-diameter pipeline in Wetzel County, West Virginia to supply natural gas from the Hastings Compressor Station to the starting point of MVP;
- 301 miles of either 42- or 48-inch-diameter pipeline along the proposed MVP route to Transco Compressor Station 165;
- about 25 miles of small diameter lateral pipeline to connect the large diameter pipeline to Atlantic's Long Run M&R Station delivery point in Randolph County, West Virginia;
- about 112 miles of 42-inch-diameter pipeline to transport about 1.44 Bcf/d natural gas from the Transco Compressor Station 165 to the Brunswick Power Station and onward to the proposed ACP Compressor Station 3;
- 183 miles of 36-inch-diameter pipeline from ACP Compressor Station 3 to Robeson County, North Carolina (i.e., Atlantic's AP-2 mainline);
- 79.3 miles of 20-inch-diameter pipeline from ACP Compressor Station 3 to the City of Chesapeake, Virginia (i.e., Atlantic's AP-3 lateral); and
- 1.1 miles of 16-inch-diameter pipeline to the future Dominion Virginia Power (DVP) electric generation facility (i.e., Atlantic's AP-5 lateral).

In addition to the pipeline segments identified above, modification of Transco's existing pipeline system from its Compressor Station 165 to the proposed ACP Woods Corner M&R Station in Buckingham County, Virginia may be required. If needed, the modifications could range from adding compression to Transco's existing system to looping the entire 65-mile-long pipeline segment. Assuming a full loop of the Transco pipeline system is necessary between Transco's Compressor Station 165 and Atlantic's proposed Woods Corner M&R Station, ACP and MVP merged systems alternative would require the construction of about 777 miles of pipeline. The cumulative lengths of the EEP and MVP (309 total miles) and ACP and SHP (641 miles) totals 950 miles. Therefore, the length of the merged system alternative would be 173 miles shorter than the cumulative mileage of each separate project.

Atlantic evaluated the feasibility of merging ACP and MVP into one pipeline system[1] by utilizing either a 42-inch-diameter pipeline with 1,440 psig operating pressure; utilizing a 42-inch-diameter pipeline with 2,075 psig operating pressure; or utilizing a 48-inch-diameter pipeline (operating pressure was not specified). Atlantic concluded that utilizing a 42-inch-diameter pipeline would require thicker-walled pipe or higher grade steel to withstand the increased operating pressure of the pipeline. According to Atlantic, the higher operating pressure would restrict Atlantic's ability to provide operational flexibility needs for potential flow rate variations and line pack, and may prohibit any future expansion of the pipeline system. As stated in section 2.7, ACP Foundation Shippers have a one-time right to request an increase in contracted capacity by participation in an Optional Expansion totaling up to 500,000 Dth/d, and have requested a

[1] Atlantic's assessment can be found under FERC Accession No. 20151217-5026 at the following website location (under the Files, select the PDF files titled "Public RR10 Alternatives 12-16.pdf): http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20151217-5026.

Second Expansion option contingent upon regulatory approvals. In addition, the improved pipe grade would increase the weight of the pipe by approximately 43 percent, require larger construction equipment to install the pipe, reduce the elasticity of the pipeline, increase the complexity of welding, and possibly increase the duration of construction. Atlantic also stated that the increased operating pressure needed to transport 3.44 Bcf/d through a 42-inch-diameter pipeline would require several additional compressor stations.

Utilizing a 48-inch-diameter pipeline to transport the combined volumes of ACP and MVP would also increase the weight and reduce the elasticity of the pipeline, increase the complexity of welding, require greater trench excavations, increase the width of the construction workspace by at least 25 feet, and increase construction complexity in steep terrain. However, the operating pressure and compression requirements of this option would be reduced and may allow for future expansion of the system.

A 48-inch-diameter pipeline would encompass an area in the trench about 30 percent larger than a 42-inch-diameter pipeline, thereby displacing at least 30 percent more spoil. Although the Interstate Natural Gas Association of America (INGAA, 1999) did not estimate construction right-of-way widths for a 48-inch-diameter pipeline, which was non-typical at the time of the study, INGAA's study did conclude that an additional 15 feet of construction right-of-way width would be needed for a 40- to 42-inch-diameter pipeline compared to a 30- to 36-inch-diameter pipeline. We have found in practice that these estimates are generally accurate. This information is useful for comparative purposes. The study further noted that other factors such as vertical slopes and side slopes, special erosion control requirements in steep areas, and stockpiling of excess rock, typically would increase construction right-of-way widths even further. These conditions would be found along ACP route, and we estimate that an additional 30 feet or more of extra construction right-of-way width would be needed for a theoretical 48-inch-diameter pipeline.

The merged system alternative using 48-inch-diameter pipe would hold several environmental advantages over constructing both projects separately, including increased collocation with existing utility rights-of-way, avoidance of the MNF and GWNF, reduced crossings of the ANST and the BRP from two to one, reduced number of access roads and contractor/pipe yards impacted, and less construction in karst topography. Merging the pipeline systems would also reduce overall land impacts by minimizing the number of access roads and contractor/pipe yards used, and by reducing the amount of permanently maintained pipeline right-of-way. Despite these environmental advantages, construction of the merged systems alternative would increase air and noise emissions due to the amount of additional compression required to transport 3.44 Bcf/d through one pipeline.

In conclusion, construction and operation of merged system alternative may hold an environmental advantage when compared to construction and operation of both ACP/SHP and MVP/EEP separately. However, pursuing this alternative would require significant time for the planning and design, result in a significant delay to the delivery of the 3.44 Bcf/d of natural gas to the proposed customers of both ACP and MVP, and would limit the ability to provide additional gas to the projects' customers. When the environmental factors, technical feasibility, and ability to meet the purpose and need of the projects are cumulatively considered, we do not find that the merged system alternative holds a significant advantage over the proposed actions and have eliminated it from further consideration.

3.2.4 LNG Import/Export

LNG is transported daily throughout the world via LNG ship carriers. Currently, the Cove Point and Elba Island LNG Terminals are the only operating LNG terminals near the projects. The Cove Point LNG Terminal was recently approved to export 7.82 million metric tons per annum (1.0 Bcf/d on average) of LNG to market. The Elba Island LNG Facility was recently approved to export about 2.5 million tons per annum (0.33 Bcf/d) of LNG to market. Theoretically, LNG could be shipped from either or both terminals to an import facility that could service ACP customers. However, there are no plans to construct and operate LNG import terminals that could reasonably service the project area. Additionally, the combined delivery volumes of Cove Point and Elba Island terminals would not be sufficient to meet the requested delivery volumes for ACP; therefore, significant modifications of the pipeline systems that deliver natural gas to the terminals would be required, and significant pipeline facilities would need to be constructed to deliver gas from a new import facility to delivery points for ACP. Due to these constraints, we do not consider the use of LNG import/export facilities a viable alternative.

3.2.5 Use of Trucks and/or Rail

LNG in relatively small volumes is transported via truck and/or rail in many locations throughout the United States, including ACP project area. Commercially available LNG tanker trucks have storage/ transmission capacities that average 10,850 gallons, and commercially available railway tankers have storage/transmission capacities that average 30,680 gallons. Based on the capacities of these systems, it would take approximately 1,674 trucks per day, or 592 railway tankers per day, to deliver the 1.44 Bcf/d of gas to the proposed delivery points of ACP. In addition, liquefaction and vaporization facilities would need to be constructed at the receipt and delivery points, respectively. Based on the number of trucks and/or rail cars that would be needed to transport the projects volumes and the facilities, time, and cost necessary to process and deliver these volumes, we have determined the use of this system would not be economically practical and have eliminated it from further review.

3.3 MAJOR ROUTE ALTERNATIVES

We considered other routes for the projects to determine if the route alternatives would avoid or reduce impacts on environmentally sensitive resources, including land use impacts. Route alternatives are typically only recommended if the alternative confers a significant environmental advantage over the proposed route. Otherwise, such an alternative merely represents a shift in impacts from one area or resource to another, or from one set of landowners to a different set of landowners. Major route alternatives are generally greater than 50 miles in length and can deviate from the proposed route by a significant distance.

3.3.1 ACP and MVP Collocation

Several commentors recommended that ACP route be collocated along the proposed MVP route. Similar to the merged systems alternative analyzed in section 3.2.3.2, the collocation alternative would involve the construction of dual 42-inch-diameter pipelines along the proposed MVP pipeline route to Transco's existing Compressor Station 165 in Pittsylvania County, Virginia. At this delivery point, the alternative would continue to ACP delivery points in Virginia and North Carolina as shown on figure 3.2.3-1. The same pipeline segments that are described in the merged systems alternative would need to be constructed for this collocation alternative; however, instead of one 301-mile-long large diameter pipeline along the MVP route, two separate 42-inch-diameter pipelines would be constructed adjacent to each other along one utility right-of-way.

The collocation alternative would provide some environmental advantages, including increased collocation along existing rights-of-way, avoidance of the MNF and GWNF, reduced crossings of the ANST and the BRP from two to one, reduced construction within karst topography, and reduced access roads and contractor and pipe yards impacts as these project areas could be utilized by each project.

The installation of two parallel pipelines for 301 miles would present significant constructability issues as a portion of MVP route in northern West Virginia follows narrow ridgelines. Based on our review of data, aerial photography, and topography, we conclude that there is insufficient space along most ridgelines in West Virginia to accommodate two parallel 42-inch-diameter pipelines. Therefore, the advantages of collocating the two projects are reduced. Additionally, implementation of this alternative would require significant planning and design, which would significantly delay the delivery of gas to Atlantic's customers. When the environmental factors, technical feasibility, and ability to meet the purpose and need of the projects are cumulatively considered, we do not find that the collocation alternative offers a significant advantage and do not recommend its adoption.

3.3.2 Multiple Electric Transmission Line Route Alternatives

Many stakeholders suggested that collocating with existing power lines would be generally preferable to a new corridor; therefore, we analyzed a set of route alternatives that parallel portions of various existing electric transmission lines across West Virginia, Virginia, and North Carolina. These include the Hastings to Dooms, Dooms to Suffolk, and Pleasant Shade to St. Pauls alternatives, as well as a route alternative that would begin at Dooms, follow a southeasterly transmission line corridor to Bremo Bluff and south to Farmville in response to public comments received during scoping. We analyzed these route alternatives separately and as a whole; to do so, we developed a new 12.9-mile-long "connector" route from AP-1 MP 145.7 that follows an existing transmission line corridor to connect to Dooms in Augusta County, Virginia, where three of the four analyzed segments either originate or terminate. We have developed this route to generally avoid concentrated development in the town of Fisherville as well as the Augusta County Source Water Protection District. This allows each segment to be analyzed as a stand-alone segment as compared to the corresponding segment of the proposed route. These route alternatives are depicted on figure 3.3.2-1 and are further described below.

3.3.2.1 Hastings to Dooms

The Hastings to Dooms segment would originate at DETI's existing Mockingbird Hill Compressor Station (i.e., approximately at MP 33.6 of the proposed TL-635 loopline) near Hastings in Wetzel County, West Virginia. The route alternative generally follows existing electric transmission line corridors north of U.S. Highway 50 through Metz, Marion, Harrison, Taylor, and Preston Counties, West Virginia. West of Rowlesburg, West Virginia, there are two transmission line corridor options: the northern corridor across Preston County, West Virginia; Garrett County, Maryland; and Grant County, West Virginia, and the southern route across Preston, Tucker, and Grant Counties, West Virginia. Both meet at Mount Storm Lake and then follow other transmission lines across Grant, Hardy, and Pendleton Counties, West Virginia and Rockingham and Augusta Counties, Virginia to terminate near Dooms. To be a stand-alone route alternative, it would have to connect to the AP-1 mainline near MP 145.7 via a 12.9-mile-long connector segment. Atlantic would also need to construct an approximate 32.6-mile-long pipeline loop for SHP that starts at the beginning of the route alternative near the Mockingbird Hill Compressor Station to fulfill receipt obligations to the south. In total, the Hastings to Dooms segment of the route alternative would measure up to 250.2 miles in length (204.7 miles of mainline pipe from Hastings to Dooms, 32.6 miles of SHP loop, and 12.9 miles of pipe from AP-1 MP 145.7 to Dooms).

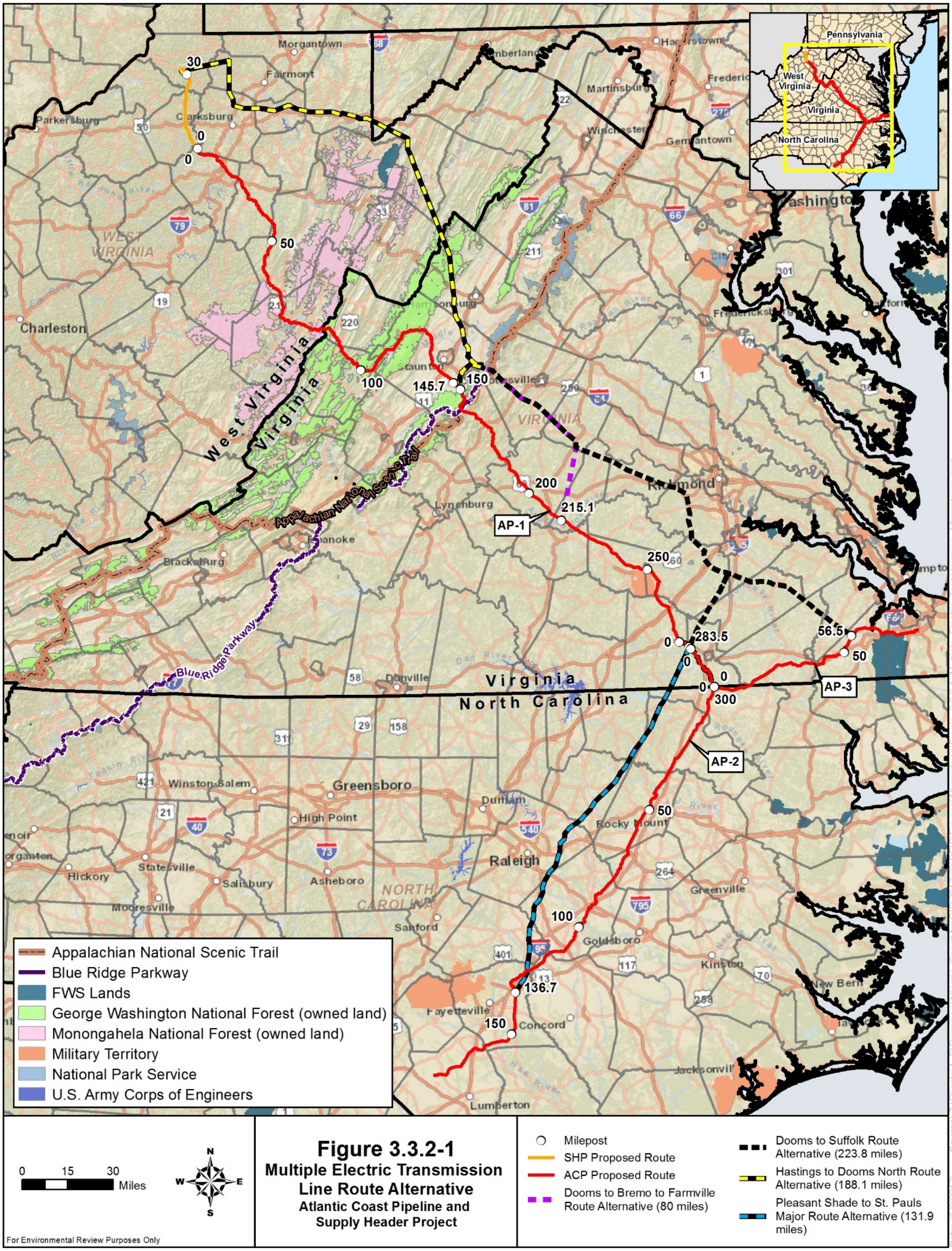


Figure 3.3.2-1
Multiple Electric Transmission Line Route Alternative
Atlantic Coast Pipeline and Supply Header Project

While transmission line corridors often offer an opportunity to increase collocation and decrease habitat fragmentation and other greenfield impacts, this segment of the route alternative would offer unique pipeline constructability issues that may not have been realized when the transmission lines were built, due to the nature of pipeline construction practices. Long stretches of steep side slope between Hastings and Mount Storm Lake, Allegheny Front, New Creek Mountain, Middle Mountain, Shenandoah Mountain, and Second Mountain would require that the pipeline be routed away from the existing corridor to cross ridges perpendicular to the slope and would add to the total length of the route alternative. This route alternative also encroaches upon developed areas of Haywood/Lumberport, West Virginia; the area along State Road 28/55 in Grant County, West Virginia; Lilly in Rockingham County, Virginia; and Fisherville and Dooms in Augusta County, Virginia, where residences and other buildings have built up adjacent to the existing electric transmission line. Alternate routes to avoid these areas could increase the length and environmental impact of the alternative, and end with non-collocated right-of-way, similar to the proposed route, just in a different location, conferring no obvious advantage. Finally, the alternative route would cross an additional 1.0 mile of land owned by the GWNF, and it is likely that Atlantic would need to construct a new corridor through the GWNF due to the amount of side slope construction that would be required along the existing transmission corridor.

The Hastings to Dooms route alternative is 43.2 miles longer than the corresponding segment of the proposed route and would introduce new routing concerns. Atlantic would likely not be able to optimize collocation with the existing transmission lines in all cases, and some deviations from the transmission line corridors could be significant, further decreasing the benefit of collocation and adding additional mileage to the project. Although in many cases, steep slopes are not in themselves construction or routing constraints, this alternative appears to only increase the number of steep slopes crossed while increasing impacts to developed areas. Based on the factors analyzed above, we find that this route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.2.2 Dooms to Suffolk

The Dooms to Suffolk segment would originate near Dooms in Augusta County, Virginia and would follow existing transmission lines across Augusta, Albemarle, Fluvanna, Cumberland, Powhatan, Chesterfield, Dinwiddie, Prince George, Sussex, and Isle of Wight Counties, Virginia. To be a stand-alone route alternative, it could to connect the AP-1 mainline near MP 145.7 via a 12.9-mile-long connector segment. It would terminate at AP-3 MP 56.5. Atlantic would need to construct an additional 27-mile-long pipeline to connect this route alternative back to AP-1 at MP 283.5 so that the pipeline could connect to the AP-4 and AP-5 lateral delivery points and the AP-2 mainline. This segment would start near Carlson and follow an existing electric transmission line south across Dinwiddie, Sussex, and Greensville Counties, Virginia. In total, the Dooms to Suffolk segment of the route alternative is about 223.8 miles in length (210.9 miles of mainline pipe from Dooms to Suffolk and the route to connect to AP-2, and 12.9 miles of pipe from AP-1 MP 145.7 to Dooms).

While transmission line corridors often offer an opportunity to increase collocation and decrease habitat fragmentation and other greenfield impacts, this segment of the route alternative presents unique routing constraints that would limit opportunities for collocation. Atlantic would likely need to construct a greenfield route to avoid NPS lands in the Shenandoah National Park and ANST crossings north of Front Royal, Virginia, which could add about 20 miles to the route alternative. The route alternative also encroaches upon developed lands near Yancey Mills in Albemarle County; Antioch in Fluvanna County; Hamilton in Cumberland County; Red Land and Holly Hills in Powhatan County; Midlothian in Chesterfield County; the area along the Appomattox River in Chesterfield and Dinwiddie Counties;

Sutherland in Dinwiddie County; and the City of Suffolk. Atlantic would likely need to develop route variations and adjustments to avoid these areas, which would add additional mileage.

The Dooms to Suffolk segment is 69.1 miles longer than the currently proposed ACP route and there are unique land use constraints along the alternative. Atlantic would likely not be able to optimize collocation with the existing transmission lines in all cases, and some deviations from the transmission line corridors could be significant, further decreasing the benefit of collocation and adding additional mileage to the Project. Based on the factors analyzed above, we find that this route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.2.3 Dooms to Bremo to Farmville

We received comments during scoping that Atlantic should consider collocating a portion of the AP-1 mainline with electric transmission lines from Dooms to Bremo and then to Farmville, Virginia. In response to these comments, we reviewed a route alternative that would begin in Dooms and travel along the transmission corridor to Bremo and head south along the electric transmission corridor to the intersection of the proposed pipeline at AP-1 MP 216.1 north of Farmville. Commentors did not propose a way to connect the AP-1 mainline to Dooms; therefore, we again used our 12.9-mile-long connector route that starts at AP-1 MP 145.7 and ends at Dooms. The portion of the corridor starting at Dooms was analyzed as part of the Dooms to Suffolk Route Alternative (see section 3.3.2.2) and the Lyndhurst to Farmville Route Alternative (see section 3.3.7.2). In total, the Dooms to Bremo to Farmville route alternative measures about 80.0 miles in length (67.1 miles of mainline pipe from Dooms to Bremo to Farmville and 12.9 miles of pipe from AP-1 MP 145.7 to Dooms).

While transmission line corridors often offer an opportunity to increase collocation and decrease habitat fragmentation and other greenfield impacts, this segment of the route alternative presents routing constraints that would limit opportunities for collocation. This segment encroaches upon developed lands near Yancey Mills in Albemarle County and Antioch in Fluvanna County; greenfield route variations and adjustments would thus likely be necessary to avoid developed lands. These same impacts would be realized along the Dooms to Suffolk route alternative where their routes are shared.

The Dooms to Bremo to Farmville Route Alternative is 10.7 miles longer than the currently proposed ACP route, and Atlantic would likely not be able to optimize collocation with the existing transmission lines in all cases. These deviations from the transmission line corridors would decrease the benefit of collocation and add additional mileage to the project. Based on the factors analyzed above, we find that this route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.2.4 Pleasant Shade to St. Pauls

The Pleasant Shade to St. Pauls Route Alternative would originate at approximate AP-1 MP 284 in Brunswick County, Virginia. The route alternative then follows an existing electric transmission line south across Brunswick County, Virginia through Northampton, Halifax, Warren, Franklin, Wake, Johnston, Harnett, Cumberland and Robeson Counties, North Carolina to AP-2 MP 136.7. Atlantic would need to construct additional laterals to reach established delivery points: the proposed AP-3 lateral would need to be extended about 15 miles to the west, and laterals would need to be constructed to reach the Greensville M&R Station (about 1 mile), the Smithfield M&R Station (about 19 miles), and the Fayetteville M&R Station (about 3 miles). The Pleasant Shade to St Pauls segment of the route alternative is about 131.9 miles in length, and the laterals would increase the length of the route alternative by about 38 miles to 169.9 total miles. The route alternative would encounter developed areas along the transmission line corridors outside Raleigh, North Carolina, and Atlantic would likely need to construct avoidance routes to the east, which would likely be greenfield and could further increase the length of the route alternative and decrease the attempted benefits of collocation.

The considered Pleasant Shade to St Pauls segment and associated laterals are approximately 14.7 miles longer than the proposed ACP route. Atlantic would likely not be able to optimize collocation with the existing transmission lines in all cases, and some deviations from the transmission line corridors could be significant, further decreasing the benefit of collocation and adding additional mileage to the project. Based on the factors analyzed above, we find that this route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project. Furthermore, Atlantic's current proposed route near Fayetteville has been designed to further collocate with existing transmission lines to the east of the city, which partially achieves the purpose of greater collocation along the AP-2 mainline than Atlantic's original route, while avoiding developed areas (see table 3.5-1).

Used alone or in any combination, these transmission line route alternatives would increase the length of the projects. It is likely that the lengths of the route alternatives would need to be further increased during engineering to avoid developed areas. This would increase the area of environmental impact of the projects, and the current state of development of these areas makes total collocation, the intent of the alternatives, highly unlikely. We conclude that the Hasting to Dooms, Dooms to Suffolk, Dooms to Bremo to Farmville, and Pleasant Shade to St Pauls segments, used alone or in any combination, do not confer a significant environmental or technical advantage when compared to the proposed route. We also find that Atlantic's other attempts to collocate with transmission lines (for example, the route variation near Fayetteville [see table 3.5-1]) offer more environmental advantage while not increasing human impacts, and we support those efforts.

3.3.3 Interstate and Highway Route Alternatives

In its FERC application, Atlantic considered collocating the proposed pipeline facilities alongside existing highways to maximize placement alongside existing linear corridors. These ideas were echoed by stakeholders during scoping; we also considered how these rights-of-way could be used to reduce habitat fragmentation. While natural gas pipelines may be sited adjacent to, but outside of a highway right-of-way, highway route alternatives present numerous construction challenges, including traversing roadway overpasses and underpasses, large interchange areas congested with commercial and residential developments, following switchbacks, and construction alongside roads that are adjacent to waterbodies. Furthermore, the use of interstate highway rights-of-way to accommodate public utilities is permissible only if the utility is in the public interest, the utility would not interfere with the safe and free flow of traffic, and the utility would not conflict with future expansions or uses of the highway. Four highway and interstate alternatives were evaluated for the projects and are depicted on figure 3.3.3-1 and described below.

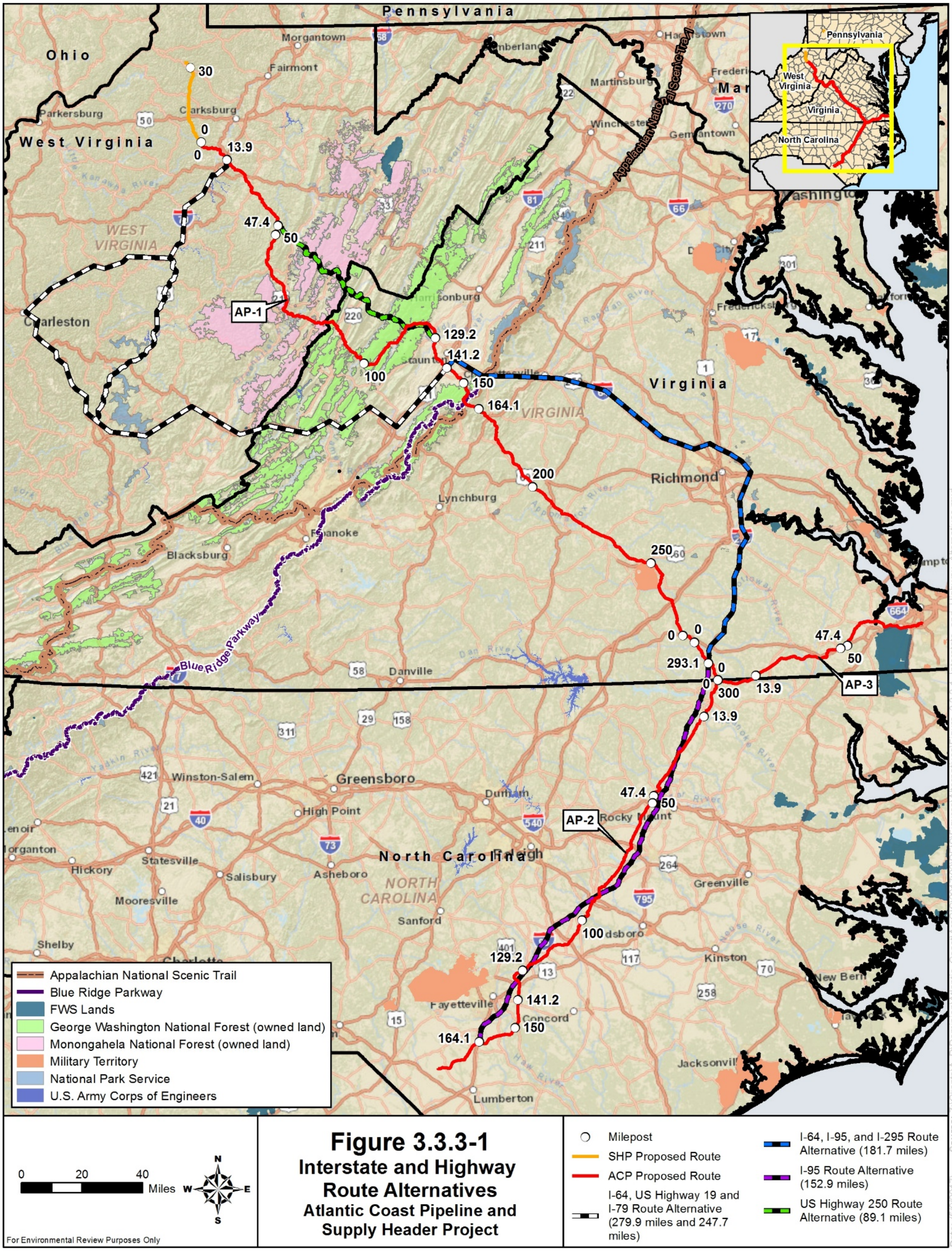


Figure 3.3.3-1
Interstate and Highway Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

- **Interstate 64/Interstate 79/ Route Alternative**: This alternative would collocate a portion of the AP-1 mainline with Interstate 64 and Interstate 79. The route alternative follows Interstate 79 south and west from AP-1 MP 13.9 to join Interstate 64 in Charleston, West Virginia, then southeast through Beckley, Lexington, and Staunton Counties, West Virginia to AP-1 MP 141.2. The route alternative is about 279.9 miles in length, which is 123.5 miles longer than the corresponding segment of the proposed route. We also considered a variation of this route alternative that follows Interstate 79 from AP-1 MP 13.9 until it intersects with U.S. Highway 19. It follows Highway 19 south until it intersects with Interstate 79 to AP-1 MP 141.2. This variation of the route alternative is about 247.7 miles in length, which is 91.3 miles longer than the corresponding segment of the proposed route.

- **U.S. Highway 250 Alternative**: This alternative would collocate a portion of the AP-1 mainline with U.S. Highway 250. The route alternative follows U.S. Highway 250 southeast from AP-1 MP 47.4 near Huttonsville, West Virginia to Augusta County, Virginia near AP-1 MP 129.2. The route alternative is approximately 89.1 miles in length, which is 22.2 miles shorter than the corresponding segment of the proposed route.

- **Interstate 64/ Interstate 295/Interstate 95 Alternative**: This alternative would collocate a portion of the AP-1 mainline with Interstate 64, Interstate 295, and Interstate 95. The route alternative follows Interstate 64 south from AP-1 MP 141.2 to Richmond, Virginia, then follows Interstate 295 north and east to Interstate 95, and then follows Interstate 95 south to Greensville County, Virginia and AP-1 MP 293.1. The route alternative is approximately 181.7 miles in length, which is 29.8 miles longer than the corresponding segment of the proposed route. This route also would require an additional lateral to connect to the Brunswick County M&R station, which resulting in an additional 46 miles of pipeline. Two additional alternatives that utilize the Interstate 64 corridor through Rockfish Gap are analyzed in section 3.3.7.

- **Interstate 95 Alternative**: This alternative would collocate a portion of the AP-1 and AP-2 mainlines with Interstate 95. The route alternative follows Interstate 95 south in Greensville County, Virginia from AP-1 MP 293.1 to AP-2 MP 164.1. The route alternative is approximately 152.9 miles in length, which is 21.7 miles shorter than the corresponding segment of the proposed route. While this route would shorten the corresponding segments of the AP-1 and AP-2 mainlines this route also would require increasing the AP-3 lateral by 4 miles, resulting in a total of 17.7 fewer miles of pipeline.

We conclude that the Interstate 79/Interstate 64 and Interstate 64/Interstate 295/Interstate 95 route alternatives are not feasible because they would add significant length to the project. Both routes also encroach upon commercial and residential areas that have become established alongside the highways, and encounter steep slopes over more miles than the proposed route. Both routing constraints would likely require Atlantic to deviate from the highway corridors, which would reduce the benefits of collocation and add additional mileage to the route, as well as additional environmental impact. Therefore, we have eliminated these routes from further consideration.

Numerous commentors, as well as FERC Staff, requested that an alternative route be evaluated that would place a portion of the pipeline route within or adjacent to the U.S. Highway 250 corridor, thereby reducing the need for disturbance in greenfield areas. The U.S. Highway 250 Route Alternative is 22.2 miles shorter than the proposed route. However, Atlantic has advised that construction along the U.S. Highway 250 route is not feasible due to the steep, mountainous terrain and highway switchback turns that follow contours and cross side-slopes. Atlantic would likely need to make route adjustments that deviate from the highway up and over ridgelines that would increase the length and reduce the benefits of collocation. Because many portions of the road are alongside waterbodies, Atlantic would likely need to construct parallel to the waterbodies (which is not desirable, and indeed is contraindicated by the FERC *Procedures*), or cross waterbodies in numerous locations, which would increase the potential for erosion and sedimentation impacts from water flowing downhill across the construction right-of-way and into the waterbody. This would also make compliance problematic with section V.B.3 of the FERC *Procedures*, which state that the route is to be designed to minimize stream crossings and that the company should maintain at least 15 feet of undisturbed vegetation between the waterbody and construction right-of-way. The alternative is also similar to the former route through the MNF and GWNF; therefore, it would likely cross areas with similar habitats and special protections that led to the FS decision to not approve that route. Finally, U.S. Highway 250 travels through Huttonsville, Durbin, and Bartow, West Virginia; and Monterey, McDowell, Head Waters, West Augusta, Lone Fountain, and Churchville, Virginia. Atlantic would seek to avoid these commercial and residential developments, which would increase the overall length of the alternative. Although commentors have suggested that collocating with this existing right-of-way would reduce impacts on landowners, it would merely transfer impacts from one set of landowners to another, while increasing the overall length of the route (and therefore the environmental disturbance), adding impacts on residential and commercial areas, and introducing constructability concerns.

Numerous commentors also requested that an alternative route be evaluated that would place a portion of the pipeline route within or adjacent to the Interstate 95 corridor, thereby reducing the need for disturbance in greenfield areas. The Interstate 95 route alternative would be a total of 17.7 miles shorter than the corresponding segments of AP-1 and AP-2 mainlines. A preliminary examination of this route appears to offer the opportunity for significant environmental benefit. However, the Interstate 95 corridor is highly developed in this area as it passes through or near Roanoke Rapids, Rocky Mount, Wilson, Selma, Smithfield, Benson, Dunn, and Fayetteville, North Carolina. About 50 entry/exit ramps are present along this stretch of the highway, and large segments of greenfield corridor would be necessary to avoid these developed areas (gas stations, restaurants, industrial or commercial facilities, etc.), which would increase the length of the pipeline and reduce or eliminate the benefits of collocation. Furthermore, we note that Atlantic's proposed route is already collocated along this stretch of the AP-2 mainline near Fayetteville.

The DOT, Federal Highway Administration (FHA) has historically prohibited installation of utilities within medians and rights-of-way of access-controlled highways. However, FHA policy has been revised recently that permits states to determine if utility facilities can be placed within these rights-of-way (FHA, 2014). In West Virginia, the West Virginia Department of Transportation (WVDOT) has established a policy for utilities, except for telecommunications facilities, that prohibits the longitudinal installation of utilities within controlled-access highway rights-of-way (WVDOT, 2007). Similarly, the Virginia Department of Transportation has instituted policies that prohibit the longitudinal installation of utilities within controlled access highway rights-of-way except in strictly defined situations that would likely not apply to natural gas pipelines (i.e., parallel installations that do not involve tree removal or severe tree trimming) (Virginia Department of Transportation [VDOT], 2011). We find that these factors, combined with the constructability and human impacts noted above for all highway alternatives, would not provide a significant environmental advantage, and we do not recommend that they be incorporated as part of the project.

3.3.4 National Forest Route Alternatives

3.3.4.1 National Forest Avoidance Route Alternatives

A significant factor in siting ACP was the location at which the pipeline would cross the ANST. In the general project area, the ANST is located on lands managed by either the NPS or FS. The NPS has indicated that it does not have the authority to authorize a pipeline crossing of the ANST on its lands. Instead, legislation proposed by Congress and signed into law by the President would be necessary to allow the NPS the authority to review, analyze, and approve a pipeline crossing of the ANST on its lands. Because of this legislative process, Atlantic considered locations where the ANST was located on lands acquired and administered by the FS, which significantly constrained the pipeline route and severely limits opportunities for avoiding and/or minimizing the use of NFS lands.

The proposed crossing of the MNF and GWNF received a considerable amount of comment and criticism from stakeholders, and accordingly, resulted in several evaluated route alternatives and variations. Numerous stakeholders requested that the pipeline be routed to avoid NFS lands altogether. Routing ACP to the south of the MNF and GWNF would increase the pipeline route by about 43 miles. Generally, as the length of a pipeline route is increased, the amount of environmental impacts on various resources are concurrently increased. However, we acknowledge that a shorter pipeline route could conceptually have significantly greater qualitative impacts on sensitive resources than a longer route, which could make the longer route preferable. In this instance, we have not identified or received any information that suggests the shorter pipeline route through the National Forests has significantly greater impacts on sensitive resources than the alternative, but acknowledge that ground resource surveys have not been conducted. Therefore, as currently analyzed, we do not recommend that an alternative south of the National Forests be incorporated as part of the project.

A route alternative to the north of the MNF and GWNF, along with other federal lands such as the Shenandoah National Park and Canaan Valley National Wildlife Refuge, would be approximately 15 miles longer than the corresponding segments of ACP and SHP. Similar to routing south of the National Forests, we do not find that avoidance of the National Forests would provide a significant environmental advantage when compared to the shorter proposed pipeline route through the National Forests. We also acknowledge that although the route would avoid designated National Forest lands, many of the same forest habitats and waterbodies would be crossed by the alternative, along with similar mountainous terrain. Therefore, we do not recommend that it be incorporated as part of the project.

3.3.4.2 Former National Forest Route

Atlantic has analyzed and adopted numerous route alternative and variations within the National Forests since the pre-filing process was initiated in November 2014. The most notable of these route adoptions occurred in March 2016 when Atlantic filed an amended FERC application and adopted the major route alternative entitled GWNF6. Atlantic adopted the GWNF6 route after the FS stated it would not approve Atlantic's former route through the National Forests. Specifically, the FS issued a letter to Atlantic on January 19, 2016, stating Atlantic's route did not meet the minimum requirements of initial screening criteria found in 36 CFR 251.54(e)(1)(i) and (ii), the route included inconsistencies with Forest Plan direction, and that Atlantic must develop and evaluate system and/or route alternatives that avoid the Cheat, Back Allegheny, and Shenandoah Mountains, and Cow Knob salamander habitat. When compared to Atlantic's originally proposed route, which included three HDD crossings that were designed to drill under the majority of Cow Knob salamander habitat, the GWNF6 route is generally 15 miles south of its former location through the National Forests (see figure 3.3.4-1).

Atlantic began civil, environmental, and cultural resources surveys of the GWNF6 route in spring and summer 2016. Through these surveys, discussions with private landowners, and continued consultation with the FS, Atlantic made several small modifications to the GWNF6 route to address stakeholder concerns and avoid resources. We have found Atlantic's adoption or rejection of these route modifications acceptable and have identified the adopted modifications in table 3.5-1; the associated environmental impacts of these adopted modifications are included as part of the overall analysis in section 4 of this EIS. Figure 3.3.4-1 depicts Atlantic's current and preferred route through the National Forests in relation to Atlantic's former route through the National Forests.

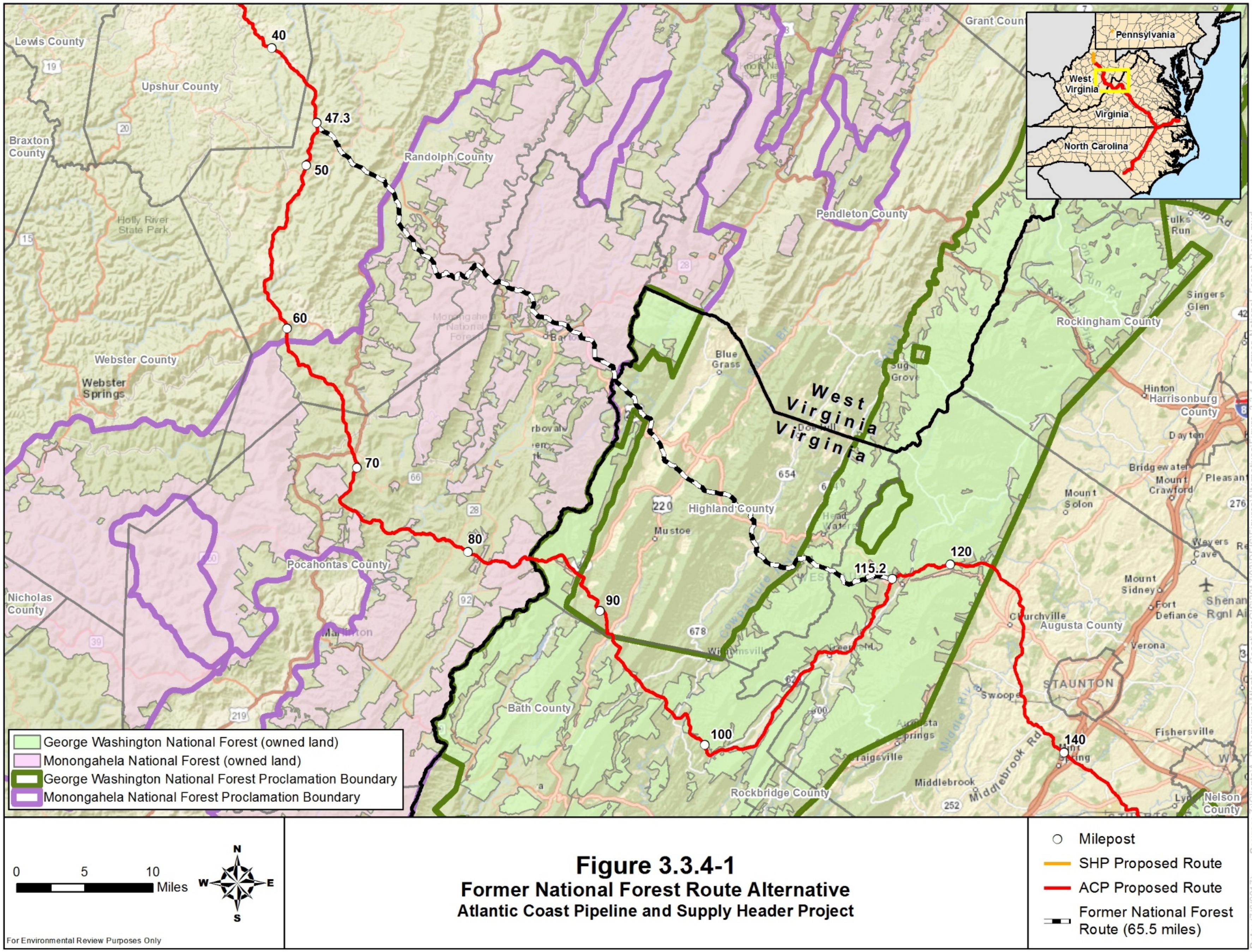


Figure 3.3.4-1
Former National Forest Route Alternative
Atlantic Coast Pipeline and Supply Header Project

Because Atlantic adopted the GWNF6 route, we have received several comments suggesting Atlantic's former route through the National Forests is preferable to the currently proposed route. While Atlantic's current route is 31.8 miles longer than the former route, and may inherently have more generalized environmental impacts than the former route (i.e., forest clearing, waterbody crossings, karst topography, steep slope construction, private landowners affected, and air emissions, among other factors), the FS' January 19, 2016 letter indicated that the FS could not approve the former route because of impacts on highly sensitive resources and because the former route would not be consistent with Forest Plan direction. Therefore, we find that Atlantic's originally proposed route through the National Forests would not meet the project objective (essentially resulting in the no-action alternative), and we do not recommend that it be incorporated as part of the project.

3.3.4.3 Appalachian National Scenic Trail and Blue Ridge Parkway Contingency Crossing

Atlantic is proposing to cross the BRP and ANST using the HDD crossing method. In this area, the ANST is located on lands acquired and administered by the FS. Figure 3.3.4-2 depicts the location of the proposed HDD and contingent direct pipe workspaces and entry/exit locations. The proposed entry workspace for the HDD is about 2,500 feet south of the BRP and the exit workspace would be about 1,300 feet north of the ANST. These workspaces would be located on private lands; therefore, the HDD method would not result in land disturbances within the GWNF or on land administered by the NPS.

Atlantic and its drilling consultant, J.D. Hair and Associates, have completed a geotechnical subsurface investigation at the HDD crossing location and have determined the proposed drill path would be constructed primarily through granodiorite bedrock and metamorphosed basalt. While completing a 4,639-foot-long HDD through these substrates is time consuming, the ability to maintain structural integrity of the drill hole and complete the drill is increased. However, we acknowledge that there is some inherent risk with the HDD method and unknown factors can cause a HDD to fail, and alluvium at the entry and exit locations could complicate the drilling process. If the proposed HDD fails, Atlantic has identified contingency crossing options[2] that it would implement to complete the crossing of the BRP and ANST as described below.

Atlantic's first contingency option is to realign the drill path and attempt a second HDD crossing. Atlantic would use the same entry and exit points to complete the second attempt, or would slightly shift the entry and exit positions to avoid local geologic factors that may have caused the initial drill to fail. Atlantic stated that any such shift in the entry and/or exit points would not require additional workspace or land impacts. We acknowledge that this contingency option would not result in additional significant environmental impacts; however, it would increase the duration for completing the BRP and ANST crossing.

Atlantic's second contingency option is to cross the BRP and ANST using the direct pipe method (see section 2.3.3.2). This option would require about 3,996 feet of the pipeline to be installed by standard upland construction methods up the north and south side of the hillside to the identified direct pipe entry and exit points. Figure 3.3.4-2 depicts the location of the proposed HDD and contingent direct pipe workspaces and entry/exit locations. The entry workspace would be about 600 feet south of the BRP, and the exit workspace would be about 400 feet north of the ANST. These workspaces would be located on private lands; therefore, the direct pipe method would not result in land disturbances within the GWNF or on land administered by the NPS.

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[2] Atlantic's *Contingency Plan for the Proposed Crossing of the BRP and ANST* can be found under FERC Accession No. 20160804-5169 at the following website location: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20160804-5169.

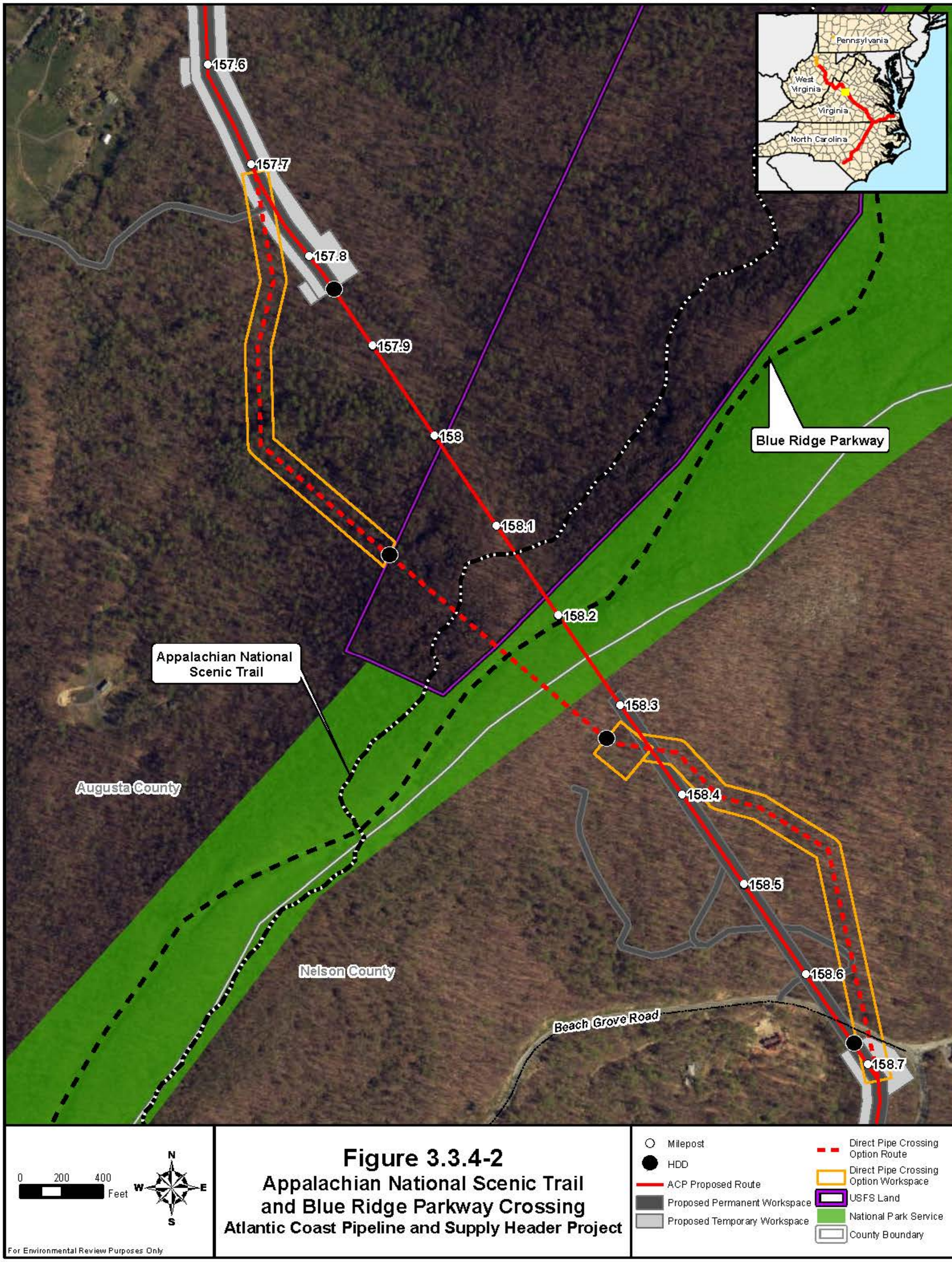


Figure 3.3.4-2
Appalachian National Scenic Trail and Blue Ridge Parkway Crossing
Atlantic Coast Pipeline and Supply Header Project

When compared to the proposed HDD crossing method, the direct pipe crossing option would result in an additional 3,996 feet (12.3 acres) of cleared pipeline right-of-way (2,124 feet [6.8 acres] on the entry side (south side) and 1,872 feet [5.5 acres] on the exit side (north side) of the mountain). Atlantic would improve an existing logging/access road off Beech Grove Road to transport equipment and personnel to the entry workspace, which would result in an additional 2 acres of forest impact. Access to the exit side would occur along the proposed pipeline construction right-of-way. Implementing this contingency option would increase the duration of project activities and the resulting air, noise, and traffic impacts from these activities near the ANST, BRP, Wintergreen Resort, and other residences and businesses in the area.

Should the Direct Pipe option be required, the pipeline right-of-way would be visible along select portions of Beach Grove Road, Mt. Torrey Road, Reeds Gap Road; by various residences and business along these roads (i.e., Fenton Inn); by residences along the northern portion of Fortunes Ridge; and from other observation points on adjacent mountain ridges. The workspaces required for the Direct Pipe option would not be visible from the BRP and ANST.

In conclusion, the Direct Pipe option would be implemented if multiple HDD attempts fail. Resulting impacts would include 12.3 acres of forest land impacts, visual impacts associated with a new pipeline right-of-way further up the mountain, and an extension of local air, noise, and traffic impacts associated with completing the Direct Pipe crossing. The Direct Pipe option would not impact NFS lands, the BRP, or the permitting requirements to cross under the BRP and ANST. While several commentors have recommended alternative routes to avoid crossing the BRP and ANST at this location (described throughout section 3), we find the implementation of the Direct Pipe option would provide a suitable contingency plan should multiple attempts of the HDD fail. The FS indicated that it believes the HDD would be feasible as proposed by Atlantic, and that the Direct Pipe option is a feasible contingency option.

3.3.5 Stuarts Draft Route Alternatives

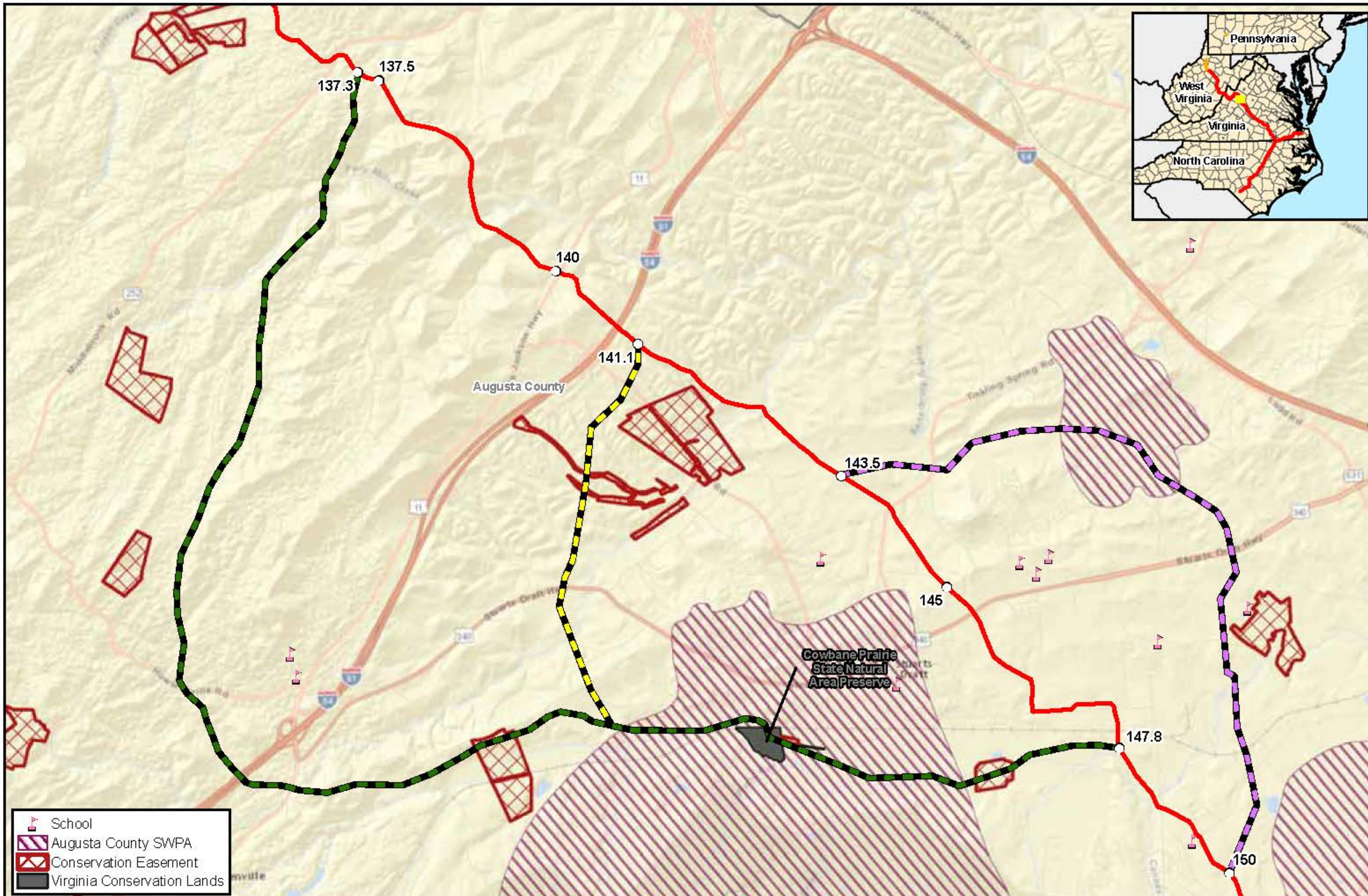
Several stakeholders, including the Augusta County Board of Supervisors, requested an alternative route that would increase the distance between the proposed route and a three-school complex in Stuarts Draft, Virginia while avoiding source water protection zones in Augusta County. Three alternative routes were analyzed to avoid the three-school complex (see figure 3.3.5-1).

Stuarts Draft Alternative 1 would increase the overall distance of the pipeline from the three schools in Stuarts Draft. However, the alternative would be 5.7 miles longer; would affect more forest land, perennial waterbodies, wetlands, Commonwealth land, and conservation easement; and would cross an additional 3.5 miles of source water protection zone than the proposed route.

Stuarts Draft Alternative 2 would also increase the overall distance of the pipeline from the three schools and would reduce the length of forest land crossed by 0.6 mile. However, the alternative is 2.4 miles longer; would affect more perennial waterbodies, wetlands, Commonwealth land, and conservation easement; and would cross an additional 3.5 miles of source water protection zone than the proposed route.

Stuarts Draft Alternative 3 would increase the overall distance of the pipeline from the three schools. However, the alternative is 1.8 miles longer and would cross an additional 1.4 miles of source water protection zone than the proposed route. The remaining environmental considerations between the two routes are similar.

The proposed AP-1 mainline route is 0.5, 0.7, and 0.9 mile from the three schools in Stuarts Draft. We do not anticipate that construction and operation of the pipeline along the currently proposed route would have a noticeable impact on these schools. Additionally, based on the increased environmental impacts summarized above, we find that the alternative routes would not provide a significant environmental advantage and do not recommend that they be incorporated as part of the project.



0 2,500 5,000 Feet

N W E S

For Environmental Review Purposes Only

Figure 3.3.5-1
Stuarts Draft Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

Milepost
SHP Proposed Route
ACP Proposed Route
Stuarts Draft Alternative 1 (16.4 miles)
Stuarts Draft Alternative 2 (9.1 miles)
Stuarts Draft Alternative 3 (7.7 miles)

3.3.6 Wingina District Route Alternatives

Over the course of project planning, Atlantic considered several route options to cross the James River and route around the multiple environmental constraints in Nelson and Buckingham Counties, Virginia. Early efforts reflected Atlantic's desire to avoid the Norwood-Wingina Rural Historic District (Wingina District), which has been recommended for listing on the Virginia Landmarks Register and recommended as eligible for listing on the NRHP. During the scoping process for this EIS, FERC received comments suggesting that Atlantic develop a route that avoids the historic district. These comments resulted in the originally proposed route presented in Atlantic's application (referred to here as the Wingina District 1 Route Alternative), which completely avoids the historic district. The Wingina District 1 Route Alternative deviates from the AP-1 mainline north of James River Road near MP 183.2, where it heads east and crosses the James River WMA and the James River. Once in Buckingham County, the route alternative heads southeasterly across the Henrico Reservoir wetland mitigation site boundary and mitigation wetlands until reconnecting with the AP-1 mainline near Warminster Church Road at MP 186.6.

The Virginia Department of Game and Inland Fisheries (VDGIF) requested during a February 2016 meeting that Atlantic further evaluate an alternate route along the northern boundary of the James River WMA, which resulted in Atlantic's development of the Wingina District 2 Route Alternative. This alternative leaves the AP-1 mainline near MP 180.3 and travels southeasterly along the northeastern edge of the WMA boundary before crossing the James River. The route alternative comes within 0.25 mile of the Yogaville Satchidananda Ashram and crosses residential areas associated with this development. The alternative then heads south, skirting the edge of the Henrico Reservoir wetland mitigation property before aligning with the Wingina District 1 Route Alternative near MP 186.6. These route alternatives are depicted on figure 3.3.6-1 and impacts from the route alternatives as compared to the corresponding segment of the proposed route are presented in table 3.3.6-1.

TABLE 3.3.6-1

Analysis of the Wingina District Route Alternatives

Features	Unit	Wingina District 1 Route Alternative	Wingina District 2 Route Alternative	Proposed Route
Length	miles	6.0	6.1	6.5
Roads crossed	number	13	14	13
James River WMA land crossed	miles	1.4	0.0	1.2
Forested land crossed	miles	5.3	4.4	5.3
Wetlands crossed	miles	0.2	0.3	0.2
Intermittent waterbodies crossed	number	9	7	10
Perennial waterbodies crossed	number	2	2	2
Warminster Historic District	miles	0.3	2.7	0.9
Henrico Reservoir mitigation wetlands crossed	miles	0.1	0.0	0.0
Henrico Reservoir mitigation stream buffers crossed	miles	0.3	0.0	0.0

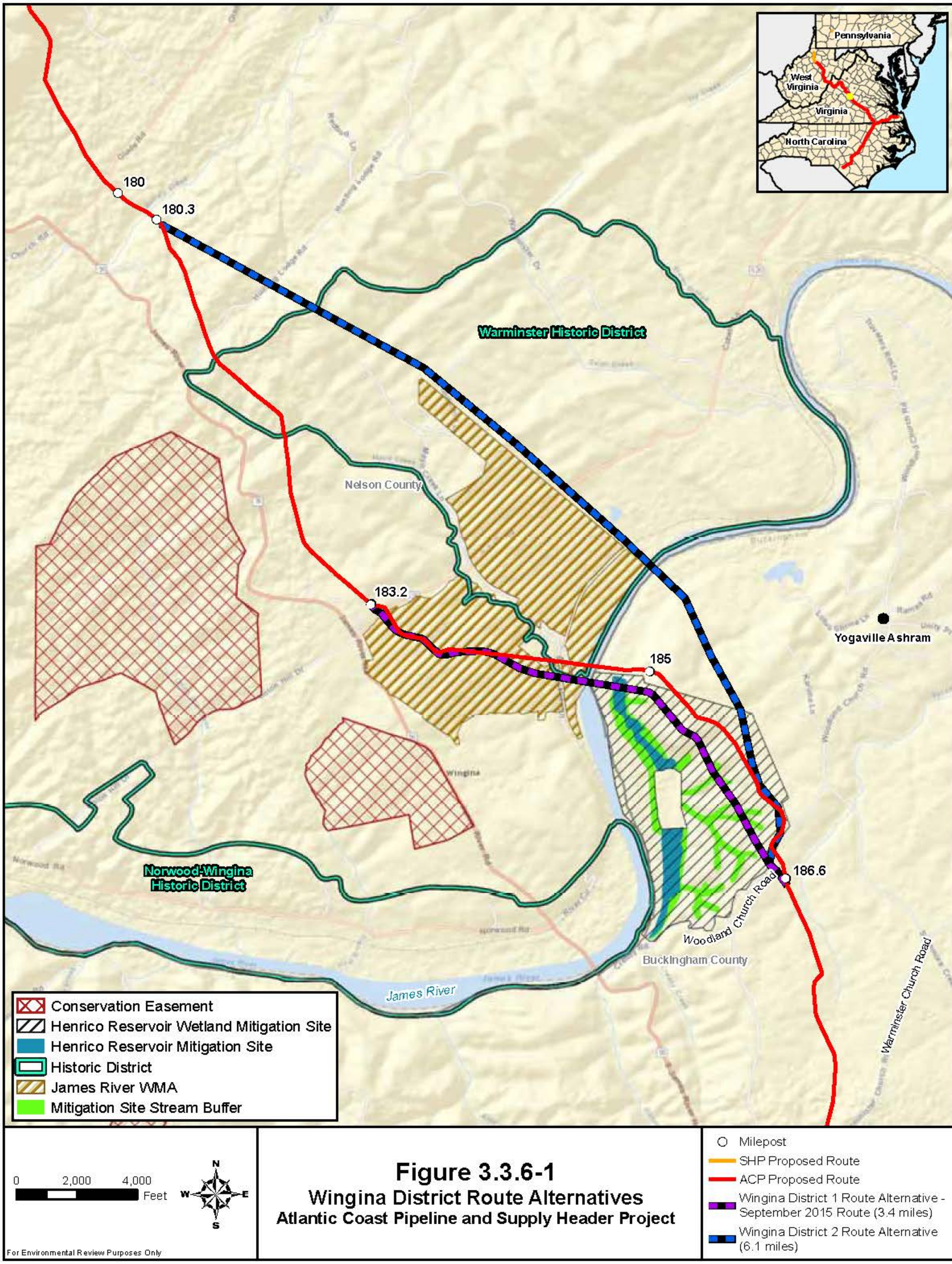


Figure 3.3.6-1
Wingina District Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

The lengths of the Wingina District 1 and 2 Route Alternatives are 0.3 and 0.4 mile shorter than their corresponding segment of the proposed route, respectively. All routes cross a similar number of wetlands, waterbodies, and roads. Impacts on the James River would be avoided by all routes through Atlantic's use of the HDD method. The Wingina District 2 Route Alternative baseline route crosses less forested land than Wingina District 1 Route Alternative or the proposed route. The Wingina District 2 Route Alternative would have the greatest impact on the Warminster Historic District; impacts on the district's features near the James River would be avoided by use of the HDD method along the proposed route or Wingina District 1 Route Alternative. In September 2015, the Virginia Department of Historic Resources (VDHR) determined that this area was eligible for listing on the NRHP because of the archeological remains of Monacan Indians and African Americans.

Atlantic's proposed route optimizes the crossing of the Henrico Reservoir wetland mitigation site as compared to the Wingina District 1 Route Alterative. The James River HDD has been designed to travel under the mitigation wetlands, which would avoid impacts; however, there would still be clearing and trenching activities across the stream buffers. The proposed route would not cross any of mitigation wetlands or stream buffers but would still cross the site boundaries, which we find appropriately mitigates the impacts on this site.

The proposed route crosses both wooded uplands and wooded bottomland along the James River within the WMA. The route crosses a railroad, Midway Mills Lane, and the James River Loop trail within the WMA. The stretch of the James River along the WMA attracts anglers, and a boat ramp lies about 0.5 mile downstream from the proposed crossing of the river. The VDGIF has expressed concern that the wetland and wildlife habitats along the proposed route may be more vulnerable to project impacts than other portions of the WMA.

As described in section 4.8.5.2, the VDGIF and FWS' Division of Wildlife and Sport Fish Restoration have jointly determined that, as proposed, the construction and operation of the ACP would result in interference of the authorized purposes of the restoration program and could jeopardize the VDGIF's eligibility for future grant funding. As such, the FWS recommends that Atlantic avoid the James River WMA, or replace the affected property with another property "that is at least of equal economic value and has fish, wildlife, and public use benefits consistent with the purposes of the original grant."

We received comments that there is a mausoleum and scattered unmarked graves throughout the WMA in an area approximately 60 feet from ACP construction workspace within the WMA; Atlantic has consulted with the VDHR regarding this site. The VDHR has requested that Atlantic use probing, backhoe stripping, or other methods to confirm that unmarked graves are not present outside the limits of the known mausoleum/cemetery. The area was visited by an archaeological survey team contracted by Atlantic in December 2015 to define the limits of the site based on visual observations. Atlantic would conduct additional work around the perimeter of this site to determine if unmarked graves are present and to confirm the cemetery boundaries. No burials would be excavated if identified. Atlantic would file the results of this survey with FERC, when available.

We are also aware of the efforts of Atlantic, the VDGIF, and the FWS to develop a route and construction plan through the WMA that addresses the concerns of the VDGIF. Some of these concerns include avoidance of sensitive management areas, limitations on construction timeframe and season to reduce impacts on users, reduction of impacts related to the HDD crossing of the James River, appropriate restoration of the pipeline right-of-way with shrubs and seed mixes that enhance wildlife habitat, maintenance of federal funding opportunities, and minimization of disruptions to the ongoing wildlife habitat management programs and recreational activities. We have reviewed correspondence between Atlantic and VDGIF regarding this crossing and are satisfied that both parties are working together to develop a route across the WMA that addresses the concerns of the VDGIF.

We find that the proposed route offers advantages over the Wingina District 1 Route Alternative. The proposed route appropriately mitigates environmental and human impacts through a shorter and optimized crossing of the James River WMA and an avoidance of the wetland and stream features within the Henrico Reservoir wetland mitigation site, while minimizing impacts on private landowners, nearby communities, and the Wingina and Warminster Historic Districts.

The Wingina District 2 Route Alternative, although developed in a response to minimize impacts on the WMAs and address concerns of the VDGIF, would present its own unique impacts. Routing along the northeast border of the James River WMA would increase impacts on historic structures and properties within the Warminster Rural Historic District. This alternate route also crosses the James River in proximity to the Yogaville Satchidananda Ashram, which has been designated a Historic District by the VDHR. We received several comments during project scoping concerning the proximity of the pipeline to this community; adoption of this route alternative would bring the route closer to the residential areas surrounding the main facilities.

The VDGIF has acknowledged that Atlantic and its consultants continue to work cooperatively with the VDGIF to avoid, minimize, or mitigate potential impacts related to the proposed route through the James River WMA. We anticipate that further discussion and negotiation may result in additional minor route modifications, and/or additional construction best management practices (BMPs) may be developed to address agency concerns and allow the facilities to be constructed within the WMA. Should this be the case, Atlantic would need to file a revision with the FERC that outlines any shifts in alignment or VDGIF-recommended construction and mitigation requirements. These modifications would be subject to FERC review and approval prior to Certificate issuance. If an easement cannot be secured within the WMA, a route outside the WMA may be required. Similarly, Atlantic would need to file a route revision with the FERC that outlines any shifts in alignment, along with an environmental and cultural assessment of the revision.

3.3.7 Rockfish Gap Route Alternatives

Numerous stakeholders have requested that ACP be routed through Rockfish Gap to avoid resource impacts within the greater Wintergreen area and the Rockfish Valley. Stakeholder-recommended alternatives through Rockfish Gap include Alternative 28 and Lyndhurst to Fishersville. The locations of these alternatives are provided on figure 3.3.7-1, and each alternative is analyzed below.

3.3.7.1 Alternative 28

Alternative 28 was proposed by the Friends of Wintergreen to avoid project impacts around the greater Wintergreen area and to minimize steep slope construction. Alternative 28 deviates from the proposed pipeline at AP-1 MP 134.2 and follows Highway 254 to the east for 1.8 miles to Highway 262, where it turns southeast for 4.7 miles along Highway 262 to Interstate 64. The alternative route then follows Interstate 64 southeast and crosses the BRP and the ANST at Rockfish Gap. The route then turns south into the Rockfish Valley along Highways 692 and 151, then turns south again along Highway 6 and Interstate 29 where it merges with the proposed pipeline at AP-1 MP 169.0. Alternative 28 is 39.2 miles long, compared to the corresponding 34.6-mile-long segment of the proposed ACP.

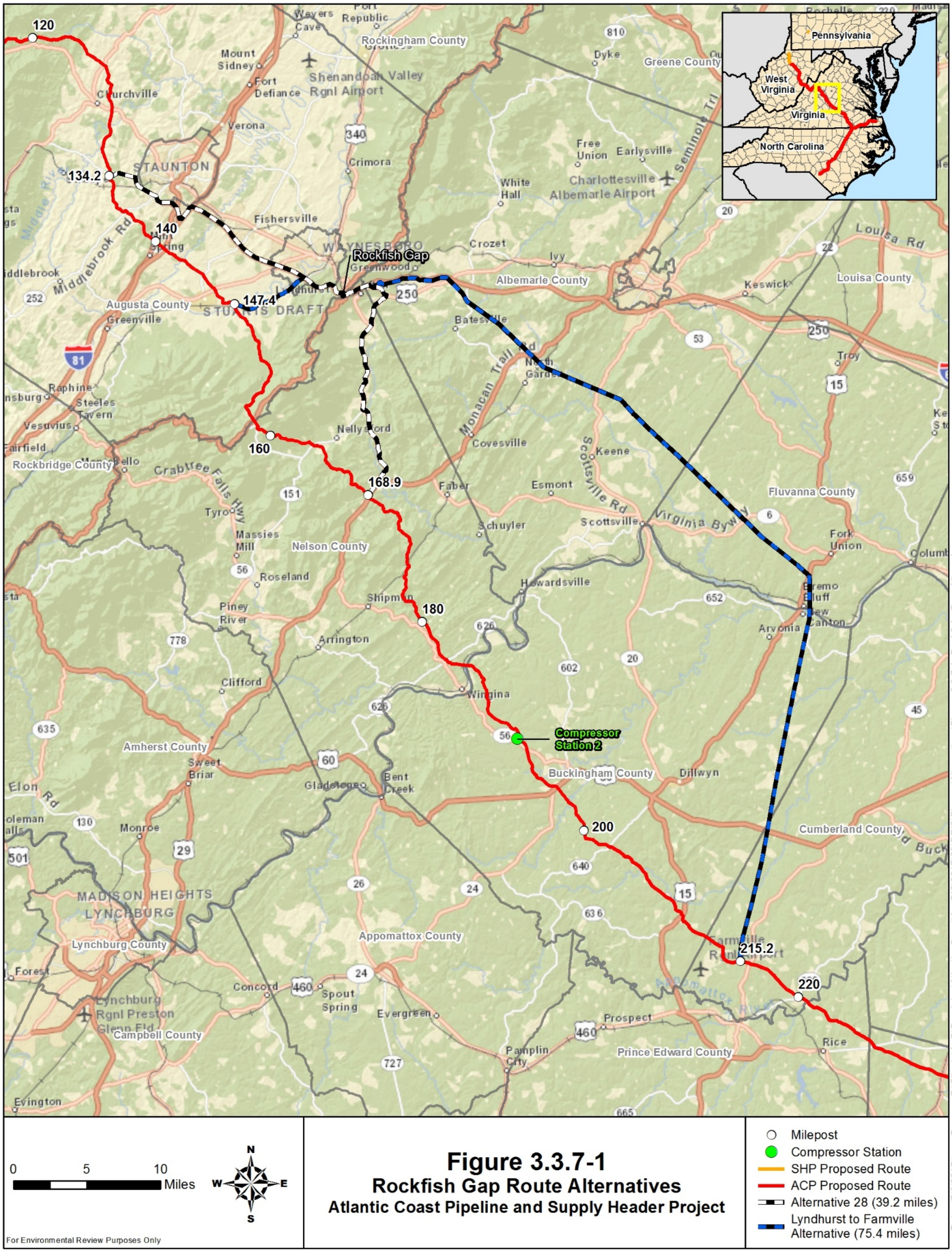


Figure 3.3.7-1
Rockfish Gap Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

The Friends of Wintergreen provided a vertical profile analysis of Alternative 28 and the corresponding segment of the proposed route, and concluded the profile along the alternative route crosses fewer steep slopes. While we concur, the analysis does not consider the amount and degree of side slope construction that would be required along Interstate 64 as it crosses Rockfish Gap. In this area, the interstate corridor has been carved into the mountainside, and extreme side-slope construction (i.e., significant grading, large workspaces, and large spoil staging areas) would be required to install the pipeline adjacent to the interstate. In addition, residential and commercial development along Highways 254, 151, 6, and Interstate 64 would prevent the installation of a 42-inch-diameter pipeline in many areas. Therefore, the alternative route would have to be modified in many areas to avoid construction constraints, which reduces the collocation advantages that this route could offer.

Completion of a HDD or bore under the BRP and ANST at Rockfish Gap is a critical component in determining the viability of alternatives through Rockfish Gap. A consultant for the Friends of Wintergreen concluded that a 500-foot-long HDD could be completed from a starting location west of the railroad tunnel. FERC staff conducted a site visit at Rockfish Gap in 2015 to review potential pipeline installation options. Based on our review, it is apparent that completion of a HDD or bore under the BRP and ANST at Rockfish Gap would be constrained by steep topography, structures, roads, bridges, a railroad tunnel, and limited locations for workspace outside of NPS lands and workspace necessary to fabricate the pull-back section of pipe, and ultimately may be infeasible.

The Friends of Wintergreen stated its concern with the location of the proposed pipeline in relation to the Wintergreen Resort road entrance. Atlantic would cross Beech Grove Road using the bore crossing method. This crossing would be limited in duration and should not affect access to the Wintergreen Resort. The Friends of Wintergreen have also expressed concerns that a pipeline explosion at or near the resort entrance could jeopardize the ability to evacuate the area, because Wintergreen Drive is the only road into or out of Wintergreen Resort. Because the pipeline would be constructed and operated in accordance with federal regulations and federal oversight, we conclude that constructing and operating the pipeline facilities would not significantly impact public safety.

The Friends of Wintergreen, along with other stakeholders, have expressed concerns that the visual impact of the temporary and permanent pipeline right-of-way would deter tourism, property development, and resort development. We conclude in section 4.9.5 that the projects would not result in significant or adverse impacts on recreational or special interest areas in Wintergreen and the Rockfish Valley. As such, and given the relative short timeframe for construction, we conclude the projects would not result in significant or adverse long-term impacts on tourism.

Based on the factors analyzed above, and the fact that Alternative 28 is 4.6 miles longer than the proposed route, we find that it would not provide a significant environmental advantage and do not recommend that Alternative 28 be incorporated as part of the project. It should be noted that Alternative 28 would cross the ANST on NPS-administered lands, and the Congressional and Presidential approval process that would be required to construct the alternative across the ANST (see section 3.3.4.1, above) was not a significant factor in our decision.

3.3.7.2 Lyndhurst to Farmville Alternative

Subsequent to its recommendation for Alternative 28, the Friends of Wintergreen recommended an additional alternative that would utilize the Interstate 64 and Rockfish Gap corridor to avoid the Wintergreen area (see figure 3.3.7-1). This Lyndhurst to Farmville Alternative deviates from the proposed pipeline near AP-1 MP 148 and heads northeast through the city of Lyndhurst to the Interstate 64 corridor. The route then turns west and follows the Interstate 64 corridor and an existing railroad right-of-way until it intersects with the Dooms/Bremo electric transmission line near Yancey Mills. The alternative then travels about 32 miles along the transmission corridor to Weber City and heads south along the electric transmission corridor to the intersection of the proposed pipeline at AP-1 MP 215.0 north of Farmville. The Lyndhurst to Farmville Alternative is 75.3 miles in length compared to the corresponding segment of the proposed ACP, which is 67.6 miles long.

The Lyndhurst to Farmville Alternative would substantially increase the amount of collocation with existing road and utility rights-of-way. However, the alternative would need to be modified to avoid construction constraints within Lyndhurst and along the Interstate 64 corridor. As previously stated in section 3.3.7.1, completion of a HDD or bore under the BRP and ANST at Rockfish Gap is constrained and likely impractical. Although the alternative would increase collocation with existing road and utility rights-of-way, we find that the additional 7.7 miles of length and construction constraints would not provide a significant environmental advantage. Additionally, because constructing and operating the pipeline facilities would not significantly impact public safety or adversely affect tourism, and we find the proposed route acceptable and do not recommend that the alternative be incorporated as part of the project. Similar to above, the Congressional and Presidential approval process that would be required to construct the alternative across the ANST was not a significant factor in our decision.

3.3.8 Love's Gap Alternatives

Similar to the Rockfish Gap alternatives, we received several comments that ACP should be routed through Love's Gap to avoid resource impacts within the greater Wintergreen and Rockfish Valley area. Three primary alternatives were proposed through Love's Gap to address these concerns: Love's Gap Highway 56, Lyndhurst to Elma, and GWNF6 Route 56. The locations of these alternative are shown on figure 3.3.8-1, and each alternative is analyzed in the following subsections.

3.3.8.1 Love's Gap Route 56 Route Alternative

At AP-1 MP 157.1, the Love's Gap Route 56 Alternative heads southwest along Highway 814 through a slightly rising valley to the BRP. The alternative crosses the BRP near Campbells Mountain Road and descends to the south along Highway 814 to the intersection of Highway 56. Following Highway 56 to the south, the alternative crosses the ANST along a FS scenic corridor and continues along Route 56 for approximately 6 miles. After crossing Highway 151, the alternative continues east for approximately 12.6 miles through relatively flat terrain and intersects the proposed pipeline at AP-1 MP 177.0. The Love's Gap Route 56 Alternative is 27.2 miles long, compared to the corresponding 20.3-mile-long segment of the proposed ACP.

The Route 56 corridor through Love's Gap is surrounded by mountainside, the Tye River, and several residences that line the road corridor. The combination of these constraints would make installation of a 42-inch-diameter pipeline along Highway 56 impractical. Therefore, the alternative would need to be modified and shifted to side-slope or ridgeline construction adjacent to the highway corridor, eliminating some benefits associated with collocation. The shift away from the Highway 56 corridor may also cause the alternative to cross portions of either the Priest Wilderness Area or Three Rivers Wilderness Area. The alternative would also require separate HDDs and/or bores under the BRP and the ANST, and up to six crossings of the Tye River. Because of these technical constraints and environmental impacts, and the fact that the route alternative is 6.9 miles longer, we find that it would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

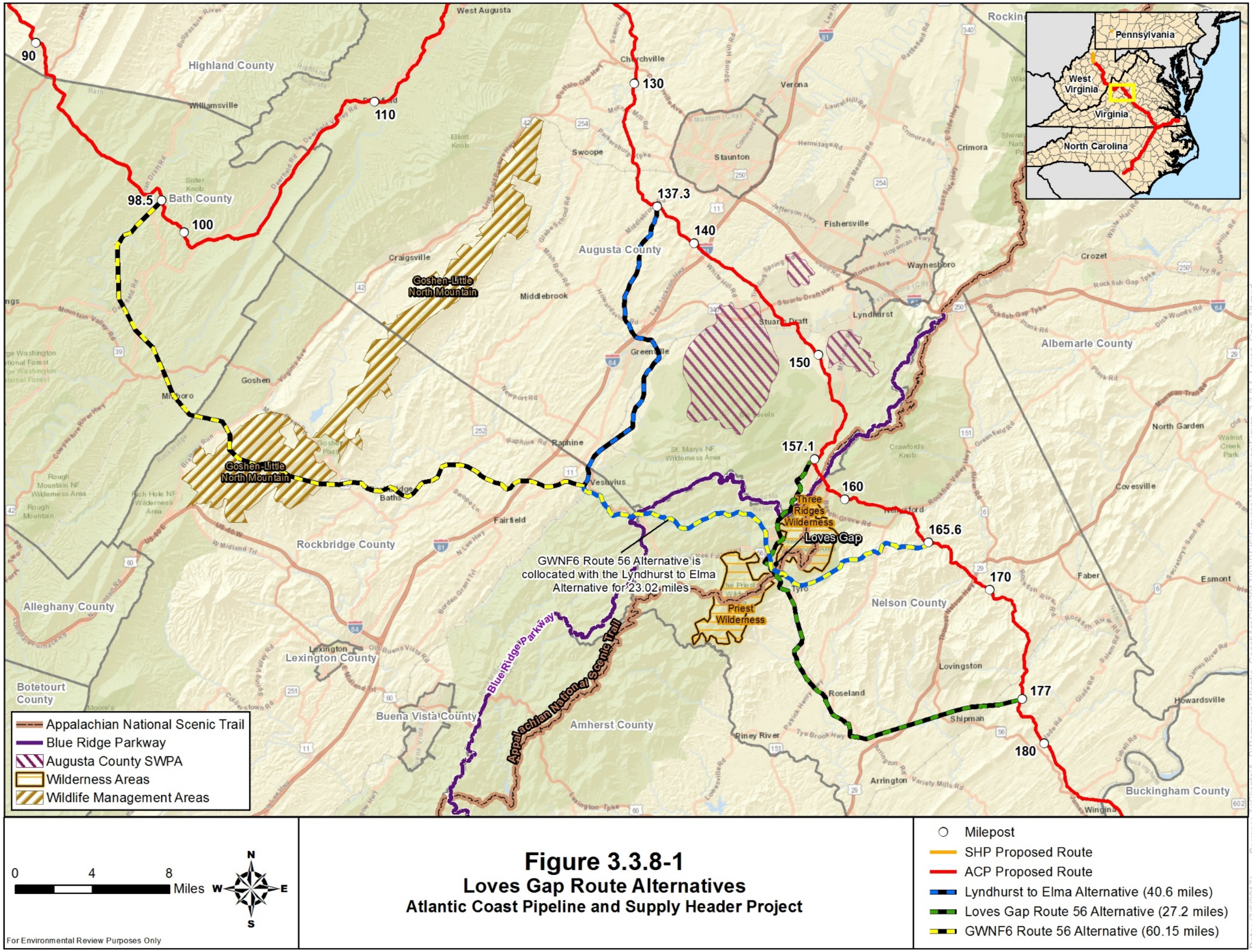


Figure 3.3.8-1
Loves Gap Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

3.3.8.2 Lyndhurst to Elma Route Alternative

The Lyndhurst to Elma Route Alternative deviates from the proposed route at AP-1 MP 137.3 and heads south through Augusta County, Virginia, across Interstate 64 and north of the city of Greenville before turning east south of Steeles Tavern. The route alternative then travels east across the BRP before joining the route of the Love's Gap Highway 56 Alternative at Love's Gap and a crossing of the ANST. Then, it proceeds east and northeast across Nelson County, Virginia before rejoining the proposed route near AP-1 MP 165.6. The Lyndhurst to Elma Route Alternative is 40.6 miles long, compared to the corresponding 27.7-mile-long segment of the proposed ACP.

As with the Love's Gap Route 56 Route Alternative presented in section 3.3.8.1, the Lyndhurst to Elma Route Alternative would face significant constructability concerns through Love's Gap that would require a route adjustment that would cross portions of either the Priest Wilderness or Three Rivers Wilderness, as well as separate HDDs and/or bores under the BRP and the ANST, and up to six crossings of the Tye River, which is known to contain sensitive mussel species. The alternative also would be 12.9 miles longer than the corresponding segment of the proposed route. Because of these technical constraints and environmental impacts associated with the additional length, and because the proposed route would not significantly impact public safety or adversely affect tourism, we find that the Lyndhurst to Elma Route Alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project. It should be noted that the regulatory process that would be required to construct the alternative across the ANST was not a significant factor in our decision.

3.3.8.3 GWNF6 Route 56 Route Alternative

The GWNF6 Route 56 Route Alternative deviates from the proposed route at AP-1 MP 98.5 in Bath County, within the GWNF. It follows an existing transmission line corridor south and west past the towns of Millsboro, Rockbridge Baths, and Vesuvius before joining the Lyndhurst to Elma Route Alternative near Steeles Tavern. The route alternative then travels east across the BRP before joining the route through Love's Gap, across the ANST, and east and northeast across Nelson County, Virginia before rejoining the proposed route near AP-1 MP 165.6. The GWNF6 Route 56 and the Lyndhurst to Elma Route Alternatives are collocated here for approximately 23.0 miles. The GWNF6 Route Alternative is 60.2 miles long, compared to the corresponding 75.0-mile-long segment of the proposed ACP.

As with the Love's Gap Route 56 Route Alternative presented in section 3.3.8.1 and the Lyndhurst to Elma Route Alternative presented in section 3.3.8.2, the GWNF6 Route 56 Route Alternative would face significant constructability concerns through Love's Gap that would require a route adjustment that would cross portions of either the Priest Wilderness or Three Rivers Wilderness, as well as separate HDDs and/or bores under the BRP and the ANST, and up to six crossings of the Tye River. Although the route alternative would be 14.8 miles shorter than the corresponding segment of the proposed route, the technical constraints and environmental impacts are notable, and therefore we find that it would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project. It should be noted that the regulatory process that would be required to construct the alternative across the ANST was not a factor in our decision.

3.3.9 South of Highway 664 Route Alternative

The South of Highway 644 Alternative was proposed by the Friends of Wintergreen to avoid construction impacts and safety concerns at the entrance to Wintergreen Resort and to minimize visual impacts on Wintergreen residences and guests. The alternative is designed to relocate the BRP and ANST HDD entry workspace approximately 1,400 feet west of its current location and route the pipeline on the south side of Rockfish Valley. From this alternate HDD entry workspace, the route would traverse the Three Ridges and Horseshoe Mountains south of Highway 664 and intersect the proposed pipeline at AP-1 MP 165.6 (see figure 3.3.9-1). The South of Highway 664 Alternative is 8.6 miles long, compared to the corresponding 7.7-mile-long segment of the proposed ACP.

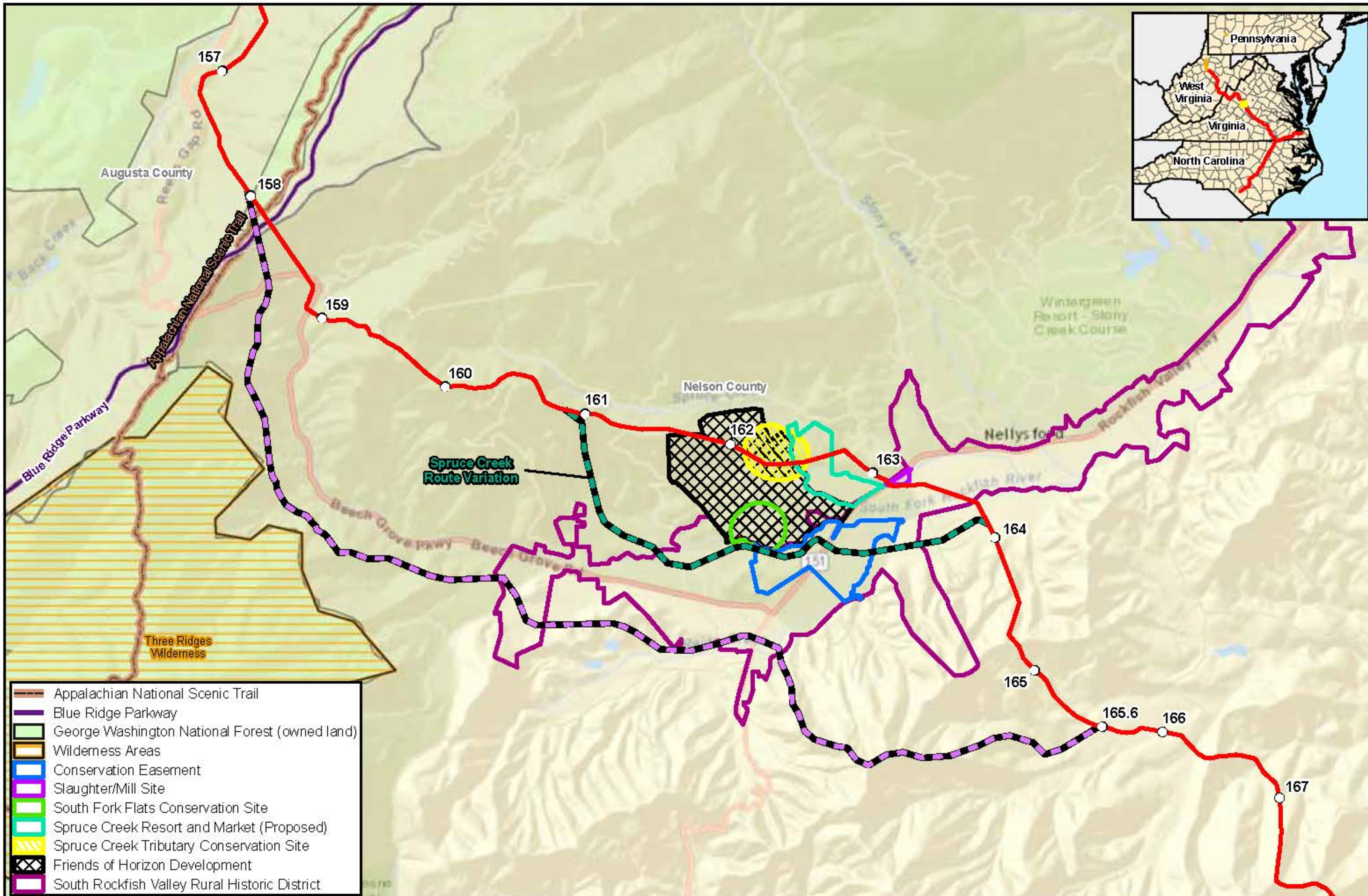


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Figure 3.3.9-1
South of Highway 664 Route Alternative
Atlantic Coast Pipeline and Supply Header Project

Milepost
SHP Proposed Route
ACP Proposed Route
South of Highway 664 Route Alternative (8.6 miles)

Date: (9/29/2016)

The distance of the alternative HDD entry workspace from the Wintergreen gate would increase by 1,400 feet. While we do not believe that this change represents a significant safety advantage, it appears that the Friends of Wintergreen consider the new location superior to the currently proposed location and we have taken that into consideration.

Based on aerial and topographic data, the alternative does not reduce the amount of side slope and steep terrain construction when compared to the proposed route, and similar visual impacts would occur along the side slopes and ridgelines of the Three Ridges and Horseshoe Mountains as would occur along the proposed route's crossing of Piney and Bryant Mountains. Therefore, the alternative would merely transfer construction constraints and visual impacts from one location to another while adding 0.9 mile to the project route. Accordingly, we find that the alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.10 Farmville Route Alternative

The Farmville Route Alternative was considered by Atlantic in its application to attempt to collocate a portion of the AP-1 mainline with existing electric transmission line corridors in Buckingham, Cumberland, Prince Edward, and Nottoway Counties, Virginia. Many stakeholders have suggested that collocating with existing power lines would generally be preferable to new greenfield corridor. The Farmville Route Alternative diverges from the proposed AP-1 mainline by traveling northeast at MP 205.4 in Buckingham County. It crosses a short stretch of greenfield before aligning with an existing transmission line for 2.2 miles east of the Willis River. It then follows this transmission line to the south, crossing the AP-1 mainline proposed route, before joining another existing transmission line that travels to the east near the Heartland Golf Club. The alternative then proceeds southeasterly alongside existing transmission lines for 24.6 miles, eventually passing north of Farmville, under the Sandy River Reservoir, north of Burkeville, and southwest of Crewe. It then heads north to follow another short stretch of greenfield to rejoin the AP-1 mainline at MP 239.8. The Farmville Route Alternative is depicted on figure 3.3.10-1, and impacts from the route alternative as compared to the corresponding segment of the proposed route are presented in table 3.3.10-1.

TABLE 3.3.10-1

Analysis of the Farmville Route Alternative

Features	Unit	Farmville Route Alternative	Proposed Route
Length (total)	miles	39.0	34.3
Primary U.S. or Commonwealth highways crossed	number	23	9
Other Commonwealth or local roads crossed	number	18	18
Adjacent to existing linear corridor facilities	miles	35.6	0.0
Commonwealth lands crossed	miles	0.1	0.0
Recreational trails crossed	number	2	0
Forested land crossed	miles	17.4	24.7
Wetlands crossed – forested/shrub	miles	1.4	1.2
Wetlands crossed – emergent	miles	0.6	0.2
Intermittent waterbodies crossed	number	51	40
Perennial waterbodies crossed	number	23	19
Battlefields crossed	miles	0.8	1.4

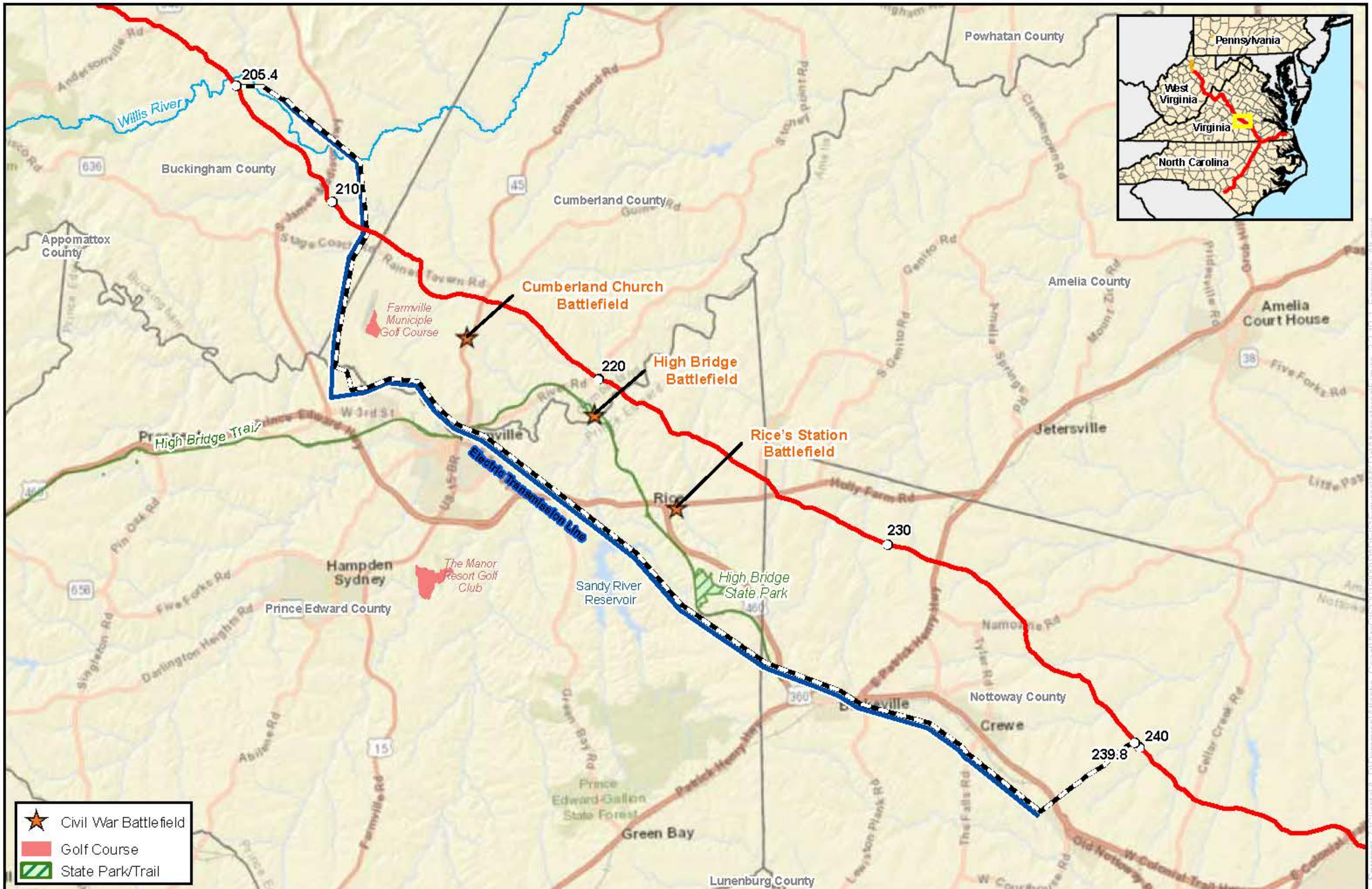

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Figure 3.3.10-1
Farmville Route Alternative
Atlantic Coast Pipeline and Supply Header Project

- Milepost
- SHP Proposed Route
- ACP Proposed Route
- Farmville Route Alternative (39 miles)

The Farmville Route Alternative is 39.0 miles long, which is 4.6 miles longer than the corresponding portion of the proposed route. The main advantages of the route alternative are that it would cross 35.6 miles less greenfield land (i.e., it is much more collocated); 7.3 fewer miles of forested land; and would not cross the High Bridge or Cumberland Church battlefields. Adoption of the route alternative would also limit forest fragmentation in the area. Conversely, the disadvantages of this route alternative are that it would cross 15 additional perennial and intermittent waterbodies as well as the Sandy River Reservoir; 14 additional primary U.S. or state highways; the High Bridge Trail State Park; and 2 crossings of the High Bridge Trail, a rail-to-trail crushed-stone hiking and biking path within the park. Most significantly, the route alternative would encroach upon developed residential areas near Farmville, Burkeville, and Crewe, whereas the proposed route avoids developed areas.

Although collocating with existing utilities often can be a means of limiting impacts on sensitive resources and reducing forest fragmentation, it does not appear to provide an environmental advantage in this case. Rather, it is merely shifting impacts from one area and set of resources to another area and set of resources (including population developments), while increasing the length of pipeline and overall acres of disturbance. This route alternative would greatly increase the number of landowners impacted by the pipeline and residential land near the three cities. Atlantic could attempt to avoid these residential areas through minor route variations, but then the collocation benefit would be lost and additional length would be added to the project, which would increase the overall total disturbance, further reducing the advantages of the alternative. Finally, the route alternative would introduce new environmental impacts on additional waterbodies and public recreational resources that the proposed route would avoid. Based on our review, we find that the route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.11 Fort Pickett Route Alternatives

The Fort Pickett Route Alternatives were developed to avoid crossing the Fort Pickett Military Reservation in Nottoway, Dinwiddie, and Brunswick Counties, Virginia. Fort Pickett is a World War II-era active military facility owned by the U.S. Department of Defense and managed by the Virginia National Guard (VA Guard). Activities that take place at Fort Pickett include aerial maneuvers, live fire ranges, operation bases, urban assault training, and other facilities (VA Guard, 2016).

Atlantic originally considered three separate routes in its September 2015 application to avoid impacts on Fort Pickett (Fort Pickett 1, 2, and 3). At the time, Atlantic selected Fort Pickett 2 as its proposed route because it avoided impacts on the base and minimized impacts on nearby conservation land held by the Virginia Outdoors Foundation (VOF) and Army Compatible Use Buffer Program (ACUB) land managed in collaboration with the Ward Burton Wildlife Foundation (WBWF). After filing its application, Atlantic further modified its originally proposed route to further minimize impacts on WBWF lands. We have analyzed Fort Pickett 2 here, as well as Fort Pickett 3, an alternative proposed by commentors during the scoping period, compared to the proposed route. Fort Pickett 1 is not further analyzed here, as it resulted in the greatest impacts on VOF and WBWF lands. The Fort Pickett Route Alternatives are depicted on figure 3.3.11-1, and impacts from the route alternatives as compared to the corresponding segment of the proposed route are presented in table 3.3.11-1.

Fort Pickett 2 diverges from the AP-1 mainline at MP 250.7 and travel southerly through several miles of WBWF land and proposed VOF conservation easements before rejoining the AP-1 mainline near MP 260.4 on the southeast corner of the base. Fort Pickett 3 also diverges from AP-1 near MP 250.7 and follows existing roads along the base's eastern boundary, wholly within the base's property before returning to the AP-1 mainline near MP 260.4.

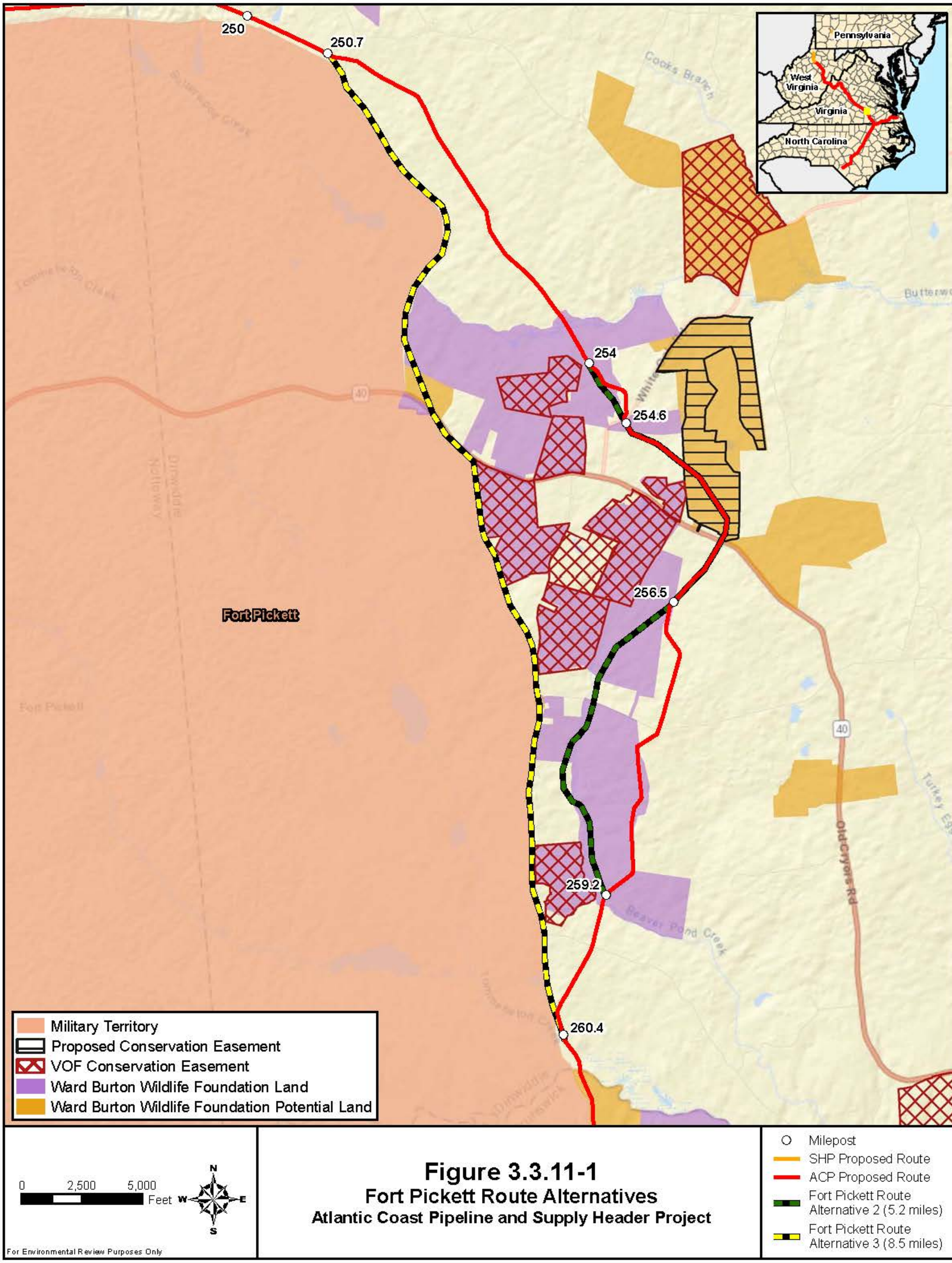

Figure 3.3.11-1
Fort Pickett Route Alternatives
Atlantic Coast Pipeline and Supply Header Project

TABLE 3.3.11-1 **Analysis of the Fort Pickett Route Alternatives**				
Features	Unit	Fort Pickett 2 Route Alternative	Fort Pickett 3 Route Alternative	Proposed Route
Length	miles	9.7	8.5	9.7
Roads crossed	number	8	4	8
Adjacent to existing linear corridor facilities (roads)	miles	0.9	8.5	2.3
Federal lands crossed (Fort Pickett)	miles	0.0	8.4	0.0
Virginia Outdoors Foundation (VOF) – Conservation easements crossed	miles	0.7	0.2	0.7
VOF – Recently adopted conservation easements crossed	miles	0.7	0.0	0.7
WBWF – Lands crossed [a]	miles	3.2	0.4	2.6
WBWF – Potential lands crossed [a]	miles	0.7	0.5	0.7
Forested lands crossed	miles	6.1	3.0	6.2
Wetlands crossed	miles	0.2	0.1	0.4
Intermittent waterbodies crossed	number	12	6	8
Perennial waterbodies crossed	number	5	1	4

Several commentors advocated for a route through the base, while others supported a route that avoids or minimizes the crossing of the base. We find that Fort Pickett 3 offers some environmental advantages as compared to Fort Pickett 2 and the proposed route. It is 1.2 miles shorter than the proposed route, is collocated with existing roads for 100 percent of its length, impacts the fewest number of private landowners, and crosses the fewest miles of forested lands and wetlands and the fewest number of waterbodies. It also crosses the fewest number of miles of VOF conservation easements. Finally, Fort Pickett 3 crosses the fewest miles of WBWF lands, which are part of a U.S. Army program to develop buffer zones around military bases to preserve the facility's function and prevent future encroachment (see section 4.8.5.2). However, we conclude that Fort Pickett 3, despite these benefits, would result in the undue risk of operating a large-diameter natural gas pipeline within the boundaries of an active military installation. Therefore, we eliminated it from further consideration in this EIS.

Fort Pickett 2 and the proposed route, when compared to one another, have similar environmental impacts. The main advantages of Fort Pickett 2 are that it would cross fewer wetlands and marginally fewer forested lands. The advantages of the proposed route are that it would cross fewer waterbodies and WBWF lands, while being collocated with more linear corridor facilities. Although conservation easements are generally established to protect or preserve an area of land in an undeveloped state, Atlantic has indicated (and VOF has confirmed) that the easements contain language that would allow pipeline construction and operation. On November 14, 2016, the Department of the Army provided confirmation that the ACP is compatible with the purpose of the ACUB program, the routes of the pipeline do not produce a significant risk to current or planned military operations, and the WBWF may proceed with easement negotiations with Atlantic. Atlantic executed easement agreements with the WBWF on November 16, 2016.

We received comments that the pipeline should be routed further from Fort Pickett, such as collocating the pipeline along Route 40, to avoid potential pipeline damage and safety concerns related to military ordinance operations. There are about 42 residences along the 4.7-mile segment of Route 40 that would limit construction of a 42-inch pipeline adjacent to the road. Additionally, because the Department of the Army indicated that the pipeline routes do not produce a significant risk to its current or planned military operations, we have not deemed the development of additional alternatives to reduce military operation safety concerns necessary.

We find that the proposed route is compatible with WBWF land management initiatives, while being further away from the boundaries of Fort Pickett. The proposed route would also decrease the risk that the pipeline's activities would impact the base, and vice versa. Therefore, based on our review, we find that Fort Pickett 2 would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.3.12 Optimized Brunswick 1 Route Alternative

In its application, Atlantic considered two routes (Brunswick 1 and Brunswick 2) to attempt to route the AP-1 mainline with a new 500 kilovolt (kV) DVP electric transmission line in Brunswick and Greensville Counties, Virginia. Atlantic chose to adopt Brunswick 2 as the proposed route in its FERC application. However, we asked Atlantic to work to further optimize the Brunswick 1 Route Alternative by increasing collocation with the existing transmission lines south of U.S. Highway 58. Atlantic did so and termed this the Optimized Brunswick 1 Route Alternative, which we consider in this analysis against the proposed route (i.e., Brunswick 2). We limit our analysis to the routes south of U.S. Highway 58, because the routes north of this point are identical.

The Optimized Brunswick 1 Route Alternative diverges from the proposed route near AP-1 MP 280.0 south of U.S. Highway 58 near the AP-4 lateral, and heads south for approximately 1.9 miles alongside an existing transmission line corridor, crossing the Norfolk Southern Railroad and Belfield Road. The route alternative then heads east for approximately 3.5 miles, adjacent to, and south of, an existing transmission line corridor, crossing Lewis Drive, and joining the proposed route east of Radium Road. The Optimized Brunswick 1 Route Alternative is depicted on figure 3.3.12-1, and impacts from the route alternative as compared to the corresponding segment of the proposed route are presented in table 3.3.12-1.

TABLE 3.3.12-1

Analysis of the Optimized Brunswick 1 Route Alternative

Features	Unit	Optimized Brunswick 1 Route Alternative	Proposed Route
Length	miles	5.3	4.2
Other Commonwealth or local roads crossed	number	7	6
Adjacent to existing linear corridor facilities	miles	5.3	0.0
Forested land crossed	miles	3.5	2.7
Wetlands crossed – forested/shrub	miles	0.5	0.1
Waterbodies crossed	number	11	2
Property owners impacted	number	56	47
Residences within 125 feet of pipeline	number	2	0

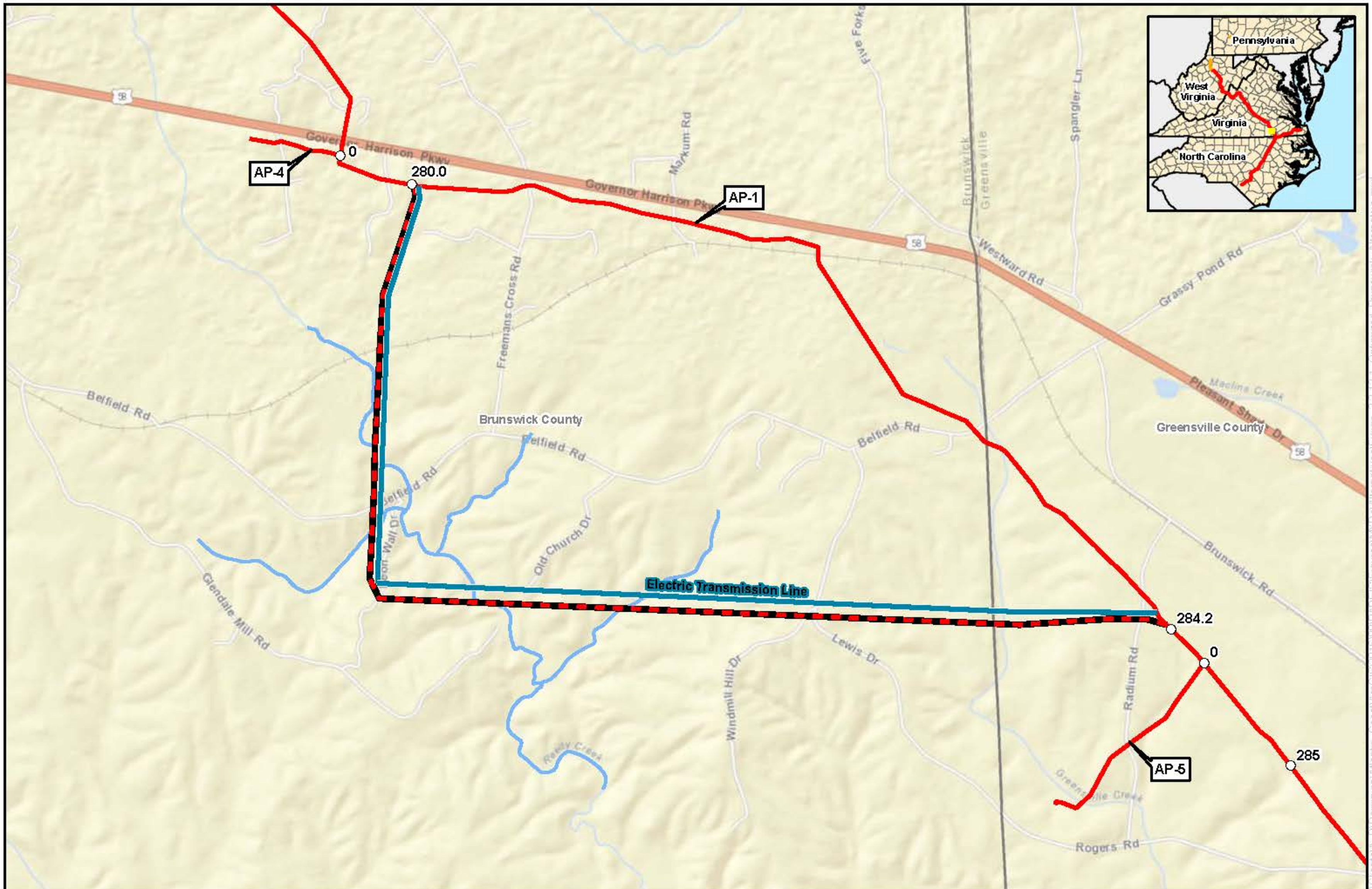

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Figure 3.3.12-1
Optimized Brunswick 1 Route Alternative
Atlantic Coast Pipeline and Supply Header Project

Milepost
SHP Proposed Route
ACP Proposed Route
Optimized Brunswick 1 Route Alternative (5.3 miles)
Reedy Creek - Webbs Mill Stream Conservation Unit

The Optimized Brunswick 1 Route Alternative is 1.1 miles longer than the corresponding segment of the proposed route. It is collocated for the entirety of its length where the proposed route, although near U.S. Highway 58, is not close enough to claim true collocation. Despite its complete collocation with existing corridors, the Optimized Brunswick 1 Route Alternative appears to have more negative human and environmental impacts than the proposed route. The route alternative would impact nine additional property owners, including two houses within 125 feet of the pipeline, and one within 50 feet of the pipeline. It would cross nine additional waterbodies, all of which are within the Reedy Creek – Webbs Mill Stream Conservation Unit (SCU) as designated by the Virginia Department of Conservation and Recreation (VDCR). SCUs "identify stream reaches that contain aquatic natural heritage resources, including upstream and downstream buffer and tributaries associated with these reaches" (VDCR, 2016a). It is the preference of the VDCR that these conservation sites be completely avoided (see Q50 – Attachment 1; FERC Accession Number 20160113-5231); Atlantic would likely need to develop a 3-mile avoidance route here to meet the VDCR's request. The route alternative also would cross more wetlands and one previously recorded archaeological site.

Although collocating with existing utilities often can be a means of limiting impacts on sensitive resources and reducing forest fragmentation, it does not appear to provide an environmental advantage in this case for the reasons presented above. Based on our review, we find that the Optimized Brunswick 1 Route Alternative would not provide a significant environmental advantage, and we do not recommend that it be incorporated as part of the project.

3.3.13 Northampton Route Alternative

The Northampton Route Alternative was presented in Atlantic's application to increase collocation with an existing electric transmission corridor near the beginning of the AP-3 lateral in Northampton County, North Carolina. The proposed AP-3 lateral heads east from Compressor Station 3 at the Virginia/North Carolina state line towards ACP's eventual interconnect with the Virginia Natural Gas pipeline in the City of Chesapeake. The Northampton Route Alternative would involve extending the AP-1 mainline south of its current terminus at Compressor Station 3 to a new terminus and proposed compressor station site approximately 4.3 miles south of its current location, as well as increasing this section of pipe to 42 inches in diameter. The AP-2 mainline and AP-3 lateral would than initiate from this new compressor station site. The Northampton Route Alternative would then travel northeasterly along an existing DVP transmission line to connect with the current AP-3 lateral at MP 6.1. The Northampton Route Alternative is depicted on figure 3.3.13-1 and impacts from the route alternative as compared to the corresponding segment of the proposed route are presented in table 3.3.13-1.

TABLE 3.3.13-1

Analysis of the Northampton Route Alternative

Features	Unit	Northampton Route Alternative	Proposed Route
Length	miles	7.8	6.1
Other state/commonwealth or local roads crossed	number	4	7
Adjacent to existing linear corridor facilities	miles	7.8	0.0
Forested lands crossed	miles	1.4	2.6
Wetlands crossed – freshwater emergent	miles	0.1	0.0
Wetlands crossed – freshwater forested/shrub	miles	0.8	0.9
Intermittent waterbodies crossed	number	3	4
Perennial waterbodies crossed	number	2	1
The Nature Conservancy floodplain forest	miles	0.0	0.3

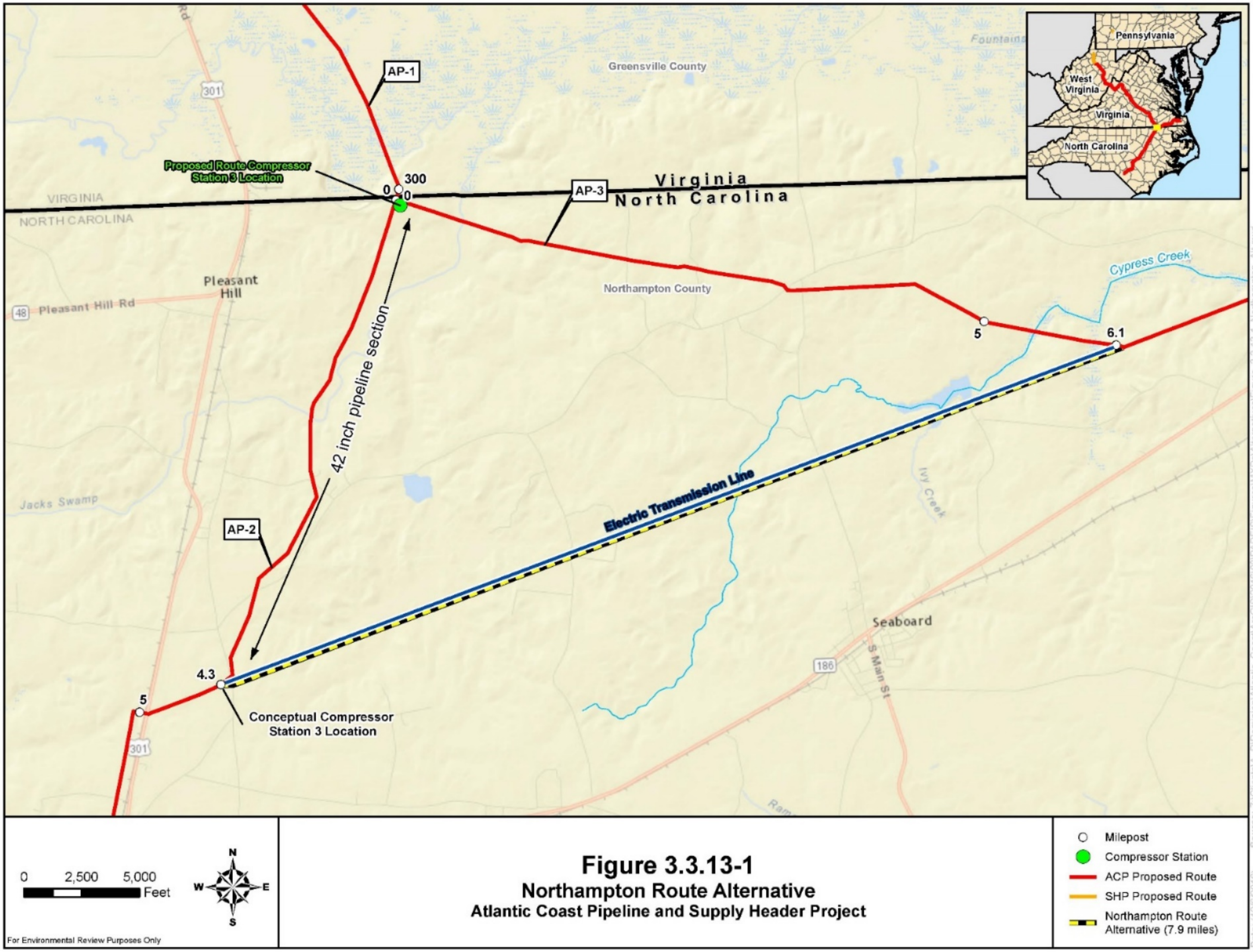


Figure 3.3.13-1
Northampton Route Alternative
Atlantic Coast Pipeline and Supply Header Project

From an infrastructure perspective, the proposed route is the shortest route; the Northampton Route Alternative would result in an additional 1.8 miles of pipeline. In addition, the larger diameter pipe used for the route alternative south of Compressor Station 3 would likely require a wider construction workspace and a marginally greater disturbance along those 4.3 miles. The Northampton Route Alternative appears to offer some minor environmental advantages: it would cross three fewer roads and 1.4 fewer miles of forested uplands, and is collocated with an existing utility corridor for 7.8 miles. It also completely avoids a new crossing of The Nature Conservancy floodplain forest, although there would still be a 0.2-mile-long crossing of this forest along the AP-2 mainline. The route alternative would, however, cross Cypress Creek one additional time, which contains the presence of the state significantly rare banded sunfish.

This route alternative would require Compressor Station 3 to be moved to a new site 4.2 miles south of the proposed site. The site of the new compressor station would be located on farmland that would be permanently converted to industrial land, and appears to have more potential sensitive noise receptors within 0.5 mile of its location than the current compressor station site. In contrast, the proposed location for Compressor Station 3 is on commercial timber land, and the landowner is amenable to the placement of the compressor station on their property.

Although collocating with existing utilities often can be a means of limiting impacts on sensitive resources, it does not appear to provide a strong enough environmental advantage in this case. The route alternative's decrease in impacts on The Nature Conservancy floodplain forests and forested areas is also notable; however, most forested areas appear to be silvicultural plots in varying stages of management. In addition, we find the current location of Compressor Station 3 to be preferable as compared to the conceptual new location. Based on our review, we find that the route alternative would not provide a significant environmental advantage and do not recommend that it be incorporated as part of the project.

3.4 ROUTE VARIATIONS

Although they can extend for several miles, route variations are different from major route alternatives in that they are usually shorter and are often designed to avoid a specific environmental resource or engineering constraint. They also typically remain within the same general area as the proposed route.

3.4.1 Spruce Creek Route Variation

The Spruce Creek Route Variation was developed in response to our request for Atlantic to evaluate an alternative route through the Rockfish Valley. We received a considerable number of comments from stakeholders within the Rockfish Valley that the pipeline should be routed to avoid several features within the Valley, including, most notably, the Spruce Creek Conservation Site, South Fork Flats Conservation Site, the Spruce Creek Resort and Market planned development, historic properties that contribute to the South Rockfish Valley Rural Historic District, Horizons Village, and the Elk Hill Conservation Easement on the south side of Rockfish Valley Highway. Stakeholders also expressed concerns about constructing the pipeline through forested areas and the visual impacts the maintained pipeline right-of-way may have on tourism in the area.

Based on these comments, we requested that Atlantic evaluate a pipeline route that optimizes the use of pasture and agricultural land in the Rockfish Valley, minimizes ridgetop and forest impacts, and avoids or minimizes impacts on cultural and historic properties, nature trails, waterbodies, the Spruce Creek Tributary Conservation Site, and planned developments. On March 10, 2016, Atlantic responded to our request and filed an evaluation of the Spruce Creek Route Variation. The variation and Atlantic's currently proposed pipeline route are shown in figure 3.4.1-1.

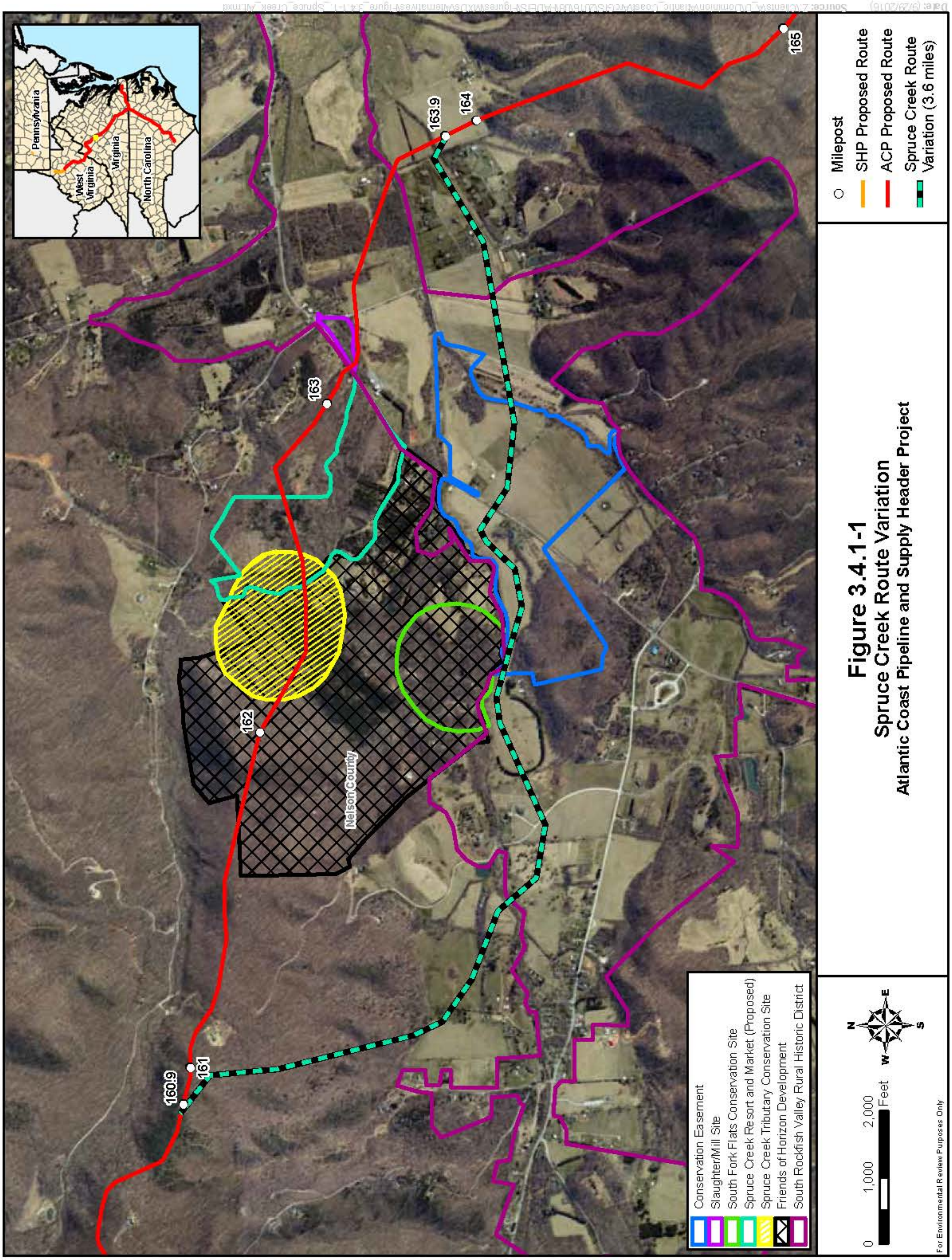


Figure 3.4.1-1
Spruce Creek Route Variation
Atlantic Coast Pipeline and Supply Header Project

On August 29, 2016, the FERC mailed letters to landowners along the Spruce Creek Route Variation and the corresponding segment of the proposed pipeline route requesting comments be filed on the route variation by September 28, 2016. Several comment letters were filed during this timeframe and are considered in our analysis, along with all other comment letters that have been filed on the docket regarding the routing in this area since the project was proposed to FERC.

Starting at AP-1 MP 160.9, Atlantic's currently proposed route heads east for 2.2 miles along the east-trending ridgeline on Bryant Mountain and enters the Rockfish Valley east of Spruce Creek. After crossing Rockfish Valley Highway, the proposed route heads southeast for 0.8 mile, crosses the South Fork Rockfish River approximately 0.4 mile east of Elk Hill Church, and heads south out of the Rockfish Valley over an eastern ridge of Horseshoe Mountain.

Relative to Atlantic's currently proposed route, the Spruce Creek Route Variation heads south off the east-trending ridgeline on Bryant Mountain for 0.8 mile and enters Rockfish Valley. At a point about 0.4 mile north of Beech Grove Road, the variation turns to the southeast and continues for 0.4 mile, crossing the South Fork Rockfish River west of Winery Lane. The variation then continues east across the valley for 2.4 miles, crossing Rockfish Valley Highway and Edgewood Drive, and then reconnects to the proposed pipeline route at AP-1 MP 163.9. A comparative analysis of environmental impacts of the proposed route and the Spruce Creek Route Variation is presented in table 3.4.1-1.

TABLE 3.4.1-1

Analysis of the Spruce Creek Route Variation

Features	Spruce Creek Route Variation	Proposed Route
General		
Total Length (miles)	3.6	3.1
Length adjacent to existing right-of-way (miles)	0	0
Human Environment		
Landowner parcels crossed (number)	15	22
Residences within 100 feet of construction workspace (number)	0	0
NFS lands crossed – Total (miles)	0	0
State/commonwealth lands crossed (number)	0	1
Spruce Creek Conservation Site Buffer (feet)	0	0.4
Planned developments (number)	0	1
Spruce Creek Resort and Market (feet)	0	0.3
Conservation easements (miles)	0.8	0
Resources		
Forested lands (miles)	0.7	2.4
Wetlands (National Wetlands Inventory) crossed (feet)	0	0
Intermittent waterbodies (number)	2	1
Perennial waterbodies (number)	2	3
Shallow bedrock crossed (acres)	0.6	1.0
Soils highly erodible by water (miles)	0.9	2.0
Steep slope (>30 percent) crossed (miles)	0.3	0.6
Moderate to high landslide incidence/susceptibility areas crossed (miles)	3.6	3.0
Karst topography crossed (miles)	0	0
South Rockfish Valley Rural Historic District crossed (length)	1.9	0.6

The Spruce Creek Route Variation is 3.6 miles long, which is 0.5 mile longer that the proposed route. The route variation would affect 15 properties compared to 22 along the proposed route; however, each route and proposed workspaces are at least 100 feet from residences. The route variation as currently designed bisects the Edgewood Park development, with the proposed centerline of the variation following a private airstrip centered in Edgewood Park. Commentors noted that the airstrip is used by landowners, by Songbird Aviation LLC, and for helicopter medical evacuations. It may be possible to route the variation to the north or south of Edgewood Park to avoid airstrip impacts, but the route would likely remain near residences of the development.

The proposed route crosses Horizons Village, a 400-acre neighborhood consisting of 40 properties. Horizons Village filed an impact assessment with FERC. This assessment, along with a field review conducted in September 2015 by FERC Staff and members of Horizons Village, has been considered in our analysis. The proposed route also crosses a 100-acre planned development known as the Spruce Creek Resort and Market, which will eventually include a resort, hotel, restaurant, and public market. This area was also reviewed by FERC Staff in September 2015, along with the conceptual drawings of the proposed development.

We note that table 3.4.1-1 indicates no wetland would be crossed by either route. National Wetlands Inventory (NWI) data, rather than field delineations, were used to make this determination. We acknowledge, based on comments received, that wetlands are likely present within the Rockfish Valley and could be crossed by either the proposed route or the route variation. We have taken this into consideration.

The proposed route crosses the conservation buffer of the Spruce Creek Tributary Conservation Site, which has been given a high biodiversity ranking as an indicator of its rarity and quality, and was established by the VDCR to protect a Central Appalachian Low-Elevation Acidic Seepage Swamp. The associated buffer that makes up the Spruce Creek Tributary Conservation Site has been deemed necessary for the seepage swamp's conservation. Comments were received regarding the avoidance of the Spruce Creek Tributary Conservation site, and a letter was received from the VDCR recommending that the conservation site be avoided.

The route variation crosses the Glenthorne Farm Stream Bank, which is comprised of 6,322 linear feet of jurisdictional stream that has been restored, enhanced, and preserved in various sections and provides compensatory mitigation for unavoidable impacts to waters of the United States. Further consultation would be required to determine whether the route variation could cross the mitigation site.

The route variation crosses slightly more land designated as moderate to high landslide incidence/susceptibility. As stated in section 4.1.7, Atlantic would construct the pipeline to comply with DOT construction and safety standards that would reduce the risk of landslides. Additionally, we do not anticipate that either route would have an adverse effect on historic structures and properties that comprise the South Rockfish Valley Rural Historic District. However, we acknowledge that we have not received all cultural survey reports for the Rockfish Valley, and cultural resources or historic properties could be identified through further field surveys and consultation with the SHPO. For instance, we have received comments from stakeholders that the old mill site located along Rockfish Valley Highway could be affected by the proposed pipeline route. Until field surveys can be completed, we cannot compare the relative impacts of the proposed route with the route variation on cultural resources or historic properties. However, we note that we would require Atlantic to avoid or mitigate all potential adverse effects to eligible or potentially eligible cultural resources or historic properties regardless of which pipeline route is selected.

We also received comments that the route variation crosses more public hiking trails than the proposed route; would impact existing businesses such as Blue Heron Farms, High View Farm and Blue

Toad Hard Cider, and a bed and breakfast; would impact agricultural and livestock practices; and would have greater tourism impacts.

The primary advantages of the proposed route are that it would reduce overall land, hiking trail and existing business impacts, landslide potential, and the length of crossing of the South Rockfish Valley Rural Historic District; and would avoid a conservation easement held by the VOF and a stream mitigation bank. The primary advantages of the Spruce Creek Route Variation are that it would reduce forest land, visual, and erodible soils impacts; reduce the number of landowners affected; and avoid the Spruce Creek Conservation site, Spruce Creek Resort and Market Planned Development, and Horizons Village. Based on the factors discussed above and information presented in the numerous comment letters filed for these routes, it does not appear that the Spruce Creek Route Variation would offer a significant environmental advantage when compared to Atlantic's proposed route and we do not recommend that it be incorporated as part of the project.

3.4.2 Westmoreland Route Variation

The Westmoreland Conservancy is coordinating with DETI to minimize impacts on two conservation easements along the proposed TL-636 pipeline route near the JB Tonkin Compressor Station.[3] Starting at TL-636 MP 3.6, Atlantic's currently proposed route deviates from an existing transmission right-of-way and heads west across Hills Church Road, crosses a tributary to Haymakers Run, heads north and east, and crosses the same tributary to Haymakers Run before terminating at the proposed terminus of the pipeline at TL-636 MP 3.8. The route variation request by Westmoreland Conservancy continues north along the transmission corridor and heads west across Hills Church Road to the terminus of the pipeline.

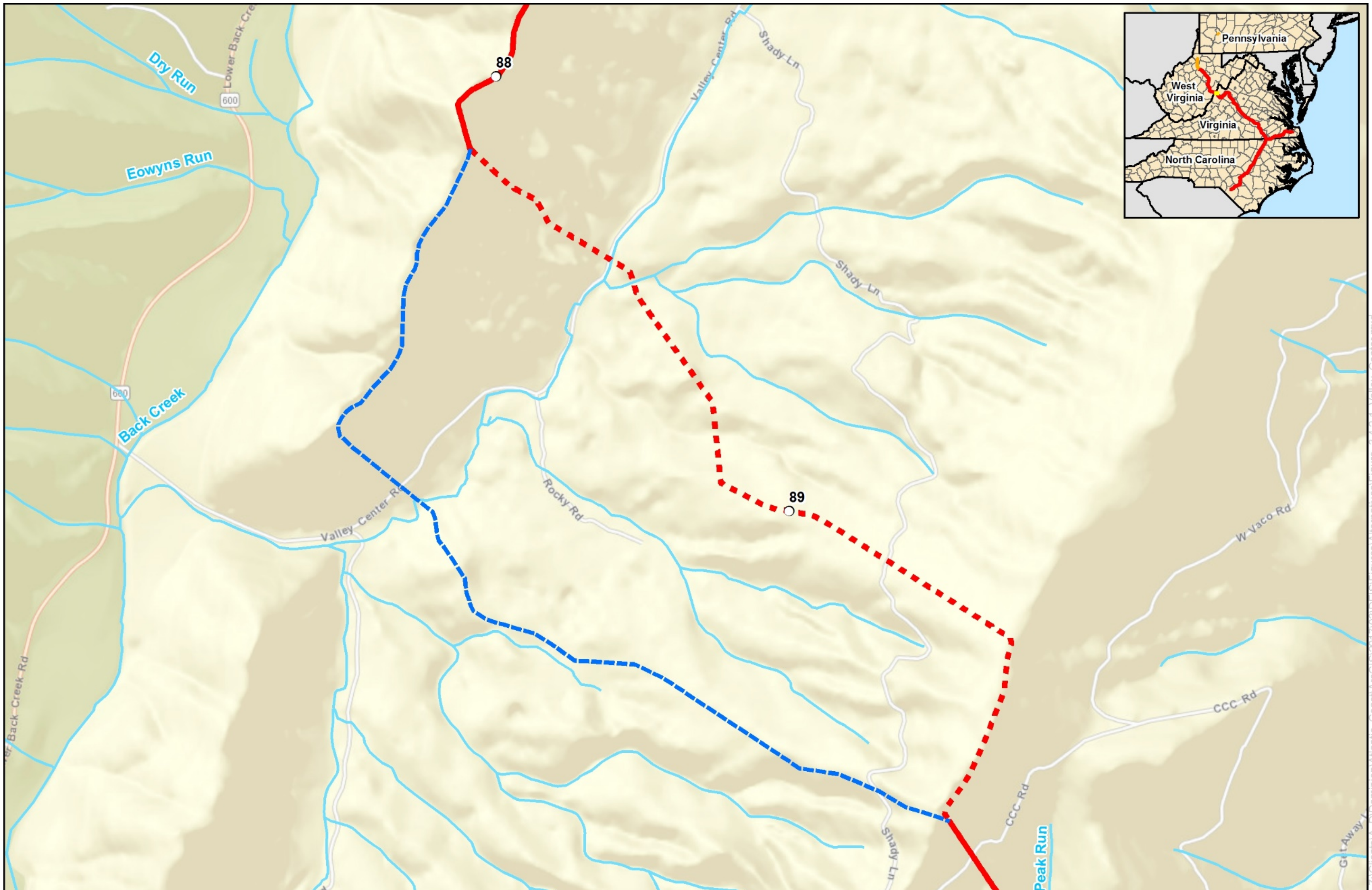
The variation appears to minimize crossing of conservation lands and eliminate waterbody and wetland impacts; however, we do not have field and civil survey information to fully evaluate the feasibility of the variation or determine whether the variation offers advantages that are environmentally significant. Therefore, we will not recommend that DETI adopt the route variation at this time. However, DETI should continue to study the route variation requested by Westmoreland Conservancy to determine overall feasibility and whether it would provide environmental advantages. Pending the results of further study and consultation, DETI may propose to adopt the route variation pursuant to recommended Environmental Condition No. 5. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, DETI should continue to consult with the Westmoreland Conservancy regarding a route variation to minimize impacts on conservation easements, and should file with the Secretary documentation regarding the results of its consultations and any proposed route modifications.**

3.4.3 Valley Center Route Variation

The Valley Center Route Variation was developed in response to our request for Atlantic to evaluate an alternative route that avoids the karst and spring features near Valley Center Road (AP-1 MP 88.5). The Valley Center Route Variation leaves the baseline route at AP-1 MP 88.2 and heads southwest about 0.8 mile along the ridgeline of Middle Mountain, and turns southeast and parallels the proposed route for about 1.7 miles before rejoining the proposed route at AP-1 MP 89.7. The variation and Atlantic's currently proposed pipeline route are shown in figure 3.4.2-1.

[3] The proposed Westmoreland Conservation Variation can be found under FERC Accession No. 20170406-5147 at the following website location: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170406-5147.



0 750 1,500 Feet

N S E W

For Environmental Review Purposes Only

Figure 3.4.2-1
Valley Center Route Variation
Atlantic Coast Pipeline and Supply Header Project

Milepost
ACP Proposed Route
Corresponding Segment of Proposed Route
Valley Center Route Variation
NHD Waterbody

Source: Z:\Clients\A_D\Dominion\Atlantic_Coast\ArcGIS\2017\03\DEIS\Figures\Alternatives\Figure_3.4.2-1_Valley_Center.mxd
Date: (5/10/2017)

As presented in table 3.4.2-1, the Valley Center Route Variation is 0.3 mile longer and would cross 12 landowners compared to 6 that would be crossed by the proposed route. The variation crosses more steep slope and forested land than the proposed route, but would avoid the field verified karst areas identified in Atlantic's Karst Survey Report. However, we note that karst surveys have not been completed along the variation to determine if similar features are present. We have received comments that the variation would be located within 1,000 feet of Campbell Spring, Huber Pit, Lighter Meadow, and Huber Crevice.

As discussed in sections 4.1.2.3 and 4.3.1.7, Atlantic has proposed several measures to minimize impacts on karst systems and private water sources, including the use of karst monitors, conducting electric resistivity surveys to avoid or minimize karst impacts, and monitoring water quality impacts during and after construction, as required. Because appropriate impact minimization and mitigation would be implemented, it does not appear that the Valley Center Route Variation would offer a significant environmental advantage when compared to Atlantic's proposed route and we do not recommend that it be incorporated as part of the project.

TABLE 3.4.2-1

Analysis of the Valley Center Route Variation

Features	Valley Center Route Variation	Proposed Route
General		
Total Length (miles)	2.5	2.2
Length adjacent to existing right-of-way (miles)	0	0
Human Environment		
Landowner parcels crossed (number)	12	6
Residences within 125 feet of construction workspace (number)	0	1
Resources		
Forested lands (miles)	2.2	2.0
Perennial waterbodies (number)	1	0
Soils highly erodible by water (miles)	2.5	2.2
Steep slope (>30 percent) crossed (miles)	1.1	0.6
Moderate to high landslide incidence/susceptibility areas crossed (miles)	2.5	2.2
Karst topography crossed (miles)	0.3	0.6

3.4.4 Butterwood Creek Route Variation

The Virginia Department of Environmental Quality (VDEQ) has recommended that the proposed route near AP-1 MP 249.6 is shifted to the south to reduce the number of stream crossings. Upon our review, it appears that routing the pipeline 500 feet to the south would reduce stream crossings from two to one and would not increase other environmental impacts. Therefore, **we recommend that:**

- **Atlantic should incorporate the Butterwood Creek Route Variation into its final route for the ACP. <u>Prior to construction</u>, Atlantic should file with the Secretary the results of all environmental surveys, an updated 7.5-minute USGS topographic quadrangle map, and a large-scale alignment sheet that illustrates this route change.**

3.5 ALTERNATIVES AND VARIATIONS PREVIOUSLY ADOPTED

Atlantic and DETI have adopted many route variations into their project designs throughout FERC's Pre-filing process and between the filing of the September 2015 application and the current proposed routes. Many of these route adjustments were adopted without a formal alternatives analysis, because the basis for the adjustment was intuitive and practical (e.g., a slight shift in the centerline to avoid a wetland; agency preferences; landowner preferences; and survey findings). In total, 201 route adjustments were adopted, totaling approximately 199 miles. Several of the route adjustments that were adopted were identified by FERC Staff, such as the Brunswick, Progress Energy Carolinas, and Boykins alternatives, which increased collocation of proposed pipeline facilities with other utility rights-of-way by about 30 miles. Table 3.5-1 lists some of the route adjustments that have been incorporated into the proposed ACP and SHP pipeline routes and the rationale for each adjustment. Because these routes were eventually proposed as part of ACP or SHP, the associated environmental impacts are included as part of the overall analysis in section 4 of this EIS.

3.6 ABOVEGROUND FACILITY LOCATION ALTERNATIVES

We evaluated the locations of the proposed aboveground facilities to determine whether environmental impacts would be reduced or mitigated by the use of alternative facility sites. Our evaluation involved inspection of aerial photography and mapping, as well as our own field work along the proposed projects' corridor and location. In evaluating these locations, we consider: amount of available land; current land use, as well as adjacent land use; location accessibility; engineering requirements; and impacts on the natural and human environments.

3.6.1 Compressor Stations

None of the proposed or alternative compressor station sites are located on NFS lands.

3.6.1.1 SHP Compressor Station Modifications

The proposed modifications to DETI's existing compressor stations would occur at or immediately adjacent to those sites and we did not identify any significant environmental constraints with the proposed locations. Further, we did not receive comments concerning those locations. Given these considerations, alternative sites for station modifications were not evaluated.

3.6.1.2 ACP Compressor Station 1

We did not receive any comments regarding alternative sites for Compressor Station 1. Based on our evaluation of the proposed site in section 4 of this EIS, we find it to be an acceptable location, and that the proposed compressor station would not result in or contribute to significant environmental impacts. As such, we did not evaluate alternative sites for this location.

TABLE 3.5-1

Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes

Route Adjustment	Approximate Mileposts	State	Rationale
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
Hollick Run	7.4 to 8.4	WV	Adjustment to decrease the length of the pipeline and provide better alignment for a river crossing
Wymer Run	9.5 to 9.8	WV	Adjustment to avoid a wetland and a cultural resource site
Life's Run	13.3 to 14.7	WV	Adjustment to reduce crossings of a known mussel stream
I-79 HDD	13.4 to 14.3	WV	Adjustment to I-79 crossing to accommodate I-79 HDD
Laurel Lick Road	18.4 to 18.8	WV	Adjustment to reduce tree clearing and reduce side slope construction
Buckhannon Run Road	19.2 to 20.1	WV	Adjustment to avoid a cultural resource site and to reduce tree clearing
Sago Road	29.5 to 30.0	WV	Adjustment to reduce the length of the pipeline and increase the distance of the pipeline from a residence and pond
Left Fork of French Creek Road	30.3 to 30.9	WV	Adjustment to reduce tree clearing
Queens Road	39.0 to 40.1	WV	Adjustment to avoid a wetland
Long Run M&R	47.1 to 47.4	WV	Adjustment to improve the approach into the Long Run M&R station
GWNF6 Route Adjustments - Blue Rock Knob/Round Knob	47.5 to 57.0	WV	Various adjustments to improve constructability, reduce tree clearing, and reduce side-slope crossings in mountainous terrain
GWNF6 Route Adjustments - Tallow Knob/Gibson Knob	69.0 to 74.0	WV	Various adjustments to improve constructability and reduce side-slope crossings in mountainous terrain, avoid impacts on the MNF, avoid karst features, and improve a stream crossing
Tallow Knob	70.1 to 70.5	WV	Adjustment to avoid an environmentally sensitive feature
Cloverlick	74.1 to 74.6	WV	Adjustment to avoid an environmentally sensitive feature
GWNF6 Route Adjustment - Greenbrier River	76.4 to 77.5	WV	Adjustment to improve crossing location of Greenbrier River
GWNF6 Route Adjustments - Allegheny Trail	77.5 to 79.0	WV	Various adjustments to improve constructability and reduce side-slope crossings in mountainous terrain, avoid a cemetery, and avoid cabins on the north side of Route 28
GWNF6 Route Adjustment - Thomas Creek	79.0 to 79.6	WV	Adjustment to improve crossing location of Thomas Creek
GWNF6 Route Adjustments - Michael Mountain/Sugar Camp Trail	79.6 to 84.7	WV/VA	Various adjustments to improve constructability and reduce side-slope crossings in mountainous terrain
Michael Mountain	*80.4 to 80.6*	*WV*	*Adjustment to avoid an environmentally sensitive feature*
GWNF6 Route Adjustment - Steep Pinch Ridge	*84.7 to 85.8*	*VA*	*Adjustment to improve constructability*
GWNF6 Route Adjustment - Back Creek	87.0 to 88.4	VA	Adjustment to avoid a wetland and increase distance from a historic school and home
GWNF6 Route Adjustment - Pine Mountain	88.5 to 89.4	VA	Adjustment to avoid an existing campground
GWNF6 Route Adjustment - Peak Run	89.6 to 90.5	VA	Adjustment to improve constructability and reduce side-slope crossings in mountainous terrain, square the route to steep slopes, and avoid impacts on a tower site
GWNF6 Route Adjustment - Singleton	91.9 to 92.7	VA	Adjustment to avoid a conservation easement
Poplar Hollow	*96.7 to 98.0*	*VA*	*Adjustment to reduce impacts on the GWNF and karst features, as well as to minimize the crossing of side-sloping topography. In addition, the adjustment has a significant reduction in length over the existing filed route*

TABLE 3.5-1 (cont'd)

Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes

Route Adjustment	Approximate Mileposts	State	Rationale
GWNF6 Route Adjustments - Gibson Hollow/Deerfield Road	*99.2 to 101.8*	*VA*	*Various adjustments to improve constructability and reduce side-slope crossings in mountainous terrain*
GWNF6 Route Adjustment - Deerfield Well	108.2 to 109.6	VA	Adjustment to route further from the Deerfield Well.
GWNF6 Route Adjustment - Hunt Heart Fort Lane	110.0 to 111.0	VA	Adjustment to avoid crossing water pipelines
GWNF6 Route Adjustment - Bear Wallow Flat	111.6 to 112.2	VA	Route adjustment to address landowner request to avoid house site and address other issues
GWNF6 Route Adjustment - Hodges Draft	112.5 to 113.4	VA	Adjustment to increase distance from a residence and address a landowner request
GWNF6 Route Adjustment - Route 716	113.5 to 114.5	VA	Adjustment
Ramsey's Draft	114.2 to 115.3	VA	Adjustment to avoid a livestock/farm paddock operation. In addition, the adjustment has a significant reduction in length over the existing filed route
Braley Pond Road	*116.3 to 117.0*	*VA*	*Adjustment to optimize crossing of Calfpasture River*
Dryden Road	125.1 to 125.4	VA	Adjustment to avoid a septic field
Hangars Mill Road	128.1 to 128.8	VA	Adjustment to avoid a karst feature
Cochrans Mill Road	139.2 to 140.2	VA	Adjustment to avoid a cultural resource site and a cave
White Hill Road	140.8 to 141.6	VA	Adjustment to avoid a waterbody crossing
Churchmans Mill Road	141.5 to 142.6	VA	Adjustment to follow property boundaries
Christians Creek	141.6 to 142.6	VA	Adjustment to avoid a wetland
Wayne Avenue	145.2 to 146.6	VA	Adjustment to follow property boundaries
Cisco Lane	147.1 to 148.2	VA	Adjustment to follow property boundaries
Schages Lane	149.3 to 149.9	VA	Adjustment to increase collocation with road
China Clay Road	149.9 to 152.0	VA	Adjustment to optimize pipeline route
Hawkins Pond Lane	152.5 to 152.7	VA	Adjustment to avoid an environmentally sensitive feature
Orebank Creek	153.4 to 153.9	VA	The route in this area incorporated a previous route adjustment designed to avoid a cultural resource site. Subsequent evaluation of the site indicates it is not a historic property. For this reason, and as requested by the landowner, Atlantic proposes to shift to its previous alignment. In addition, the adjustment has a reduction in length over the existing filed route
Mount Torrey Road	155.4 to 156.0	VA	Adjustment to avoid a residence
Sherando Lake Road	156.5 to 157.6	VA	Adjustment to increase distance from residences
Mount Torrey Road	156.8 to 157.4	VA	Adjustment to accommodate an HDD pullback
Wintergreen Drive	158.7 to 159.2	VA	Adjustment to avoid road crossing
Beech Grove Road	158.9 to 159.1	VA	Adjustment to improve slope crossing
Bryant Mountain Road	160.0 to 160.7	VA	Adjustment to increase distance from residences and avoid road crossings
Winery Lane	160.9 to 161.4	VA	Adjustment to increase distance from residences
Horizons Village II	162.0 to 162.8	VA	Adjustment to avoid a seep at the Spruce Creek Conservation Site
Glenthorne Loop Road	163.1 to163.7	VA	Adjustment to minimize crossing of Bold Rock Cidery
Gullysville Lane	164.7 to 166.1	VA	Adjustment to reduce side-slope crossings
Stagebridge Road	170.0 to 171.6	VA	Adjustment to avoid a proposed building and address a landowner request
Stagebridge Road	170.1 to 170.8	VA	Adjustment to avoid structures, septic fields, wells, and springs
Starvale Lane	171.2 to 172.2	VA	Adjustment to reduce tree clearing
Laurel Road	174.2 to 176.9	VA	Adjustment to reduce side-slope crossings
Cabell Road	183.2 to 184.2	VA	Adjustment to avoid future home sites
Woodland Church Road	185.0 to 186.4	VA	Adjustment to reduce side-slope crossing

TABLE 3.5-1 (cont'd)

Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes

Route Adjustment	Approximate Mileposts	State	Rationale
Warminister Church Road	188.0 to 189.9	VA	Adjustment to reduce tree clearing as requested by a landowner and to avoid a cultural resource site
Sycamore Creek Road	189.7 to 190.4	VA	Adjustment to meet a landowner request to avoid a family recreation site
Shelton Store Road	190.6 to 190.9	VA	Adjustment to meet a landowner request
Compressor Station 2	191.2 to 192.2	VA	Adjustment to connect to Compressor Station 2
Compressor Station 2	191.3 to 192.1	VA	Adjustment to optimize approach and exit from Compressor Station 2
Licky Branch	198.2 to 199.1	VA	Adjustment to avoid a waterbody crossing
Horsepen WMA	199.0 to 200.0	VA	Adjustment to avoid Horsepen WMA
Dixie Hill Road	200.5 to 201.7	VA	Adjustment to avoid a cultural resource site
Dixie Hill Road	201.3 to 201.6	VA	Adjustment to avoid haul roads and stabilized areas at the request of the landowner
Bucking B Ranch Lane	203.1 to 203.2	VA	Adjustment to avoid a haul road and stabilized areas at the request of the landowner
Rock Mill Road	203.5 to 204.6	VA	Adjustment to reduce the number of landowners crossed
Rock Mill Road II	203.5 to 204.6	VA	Adjustment to address a landowner request
Old Curdsville Road	208.1 to 209.0	VA	Adjustment to address a landowner request
Old Curdsville Road	208.6 to 208.9	VA	Adjustment to meet landowner request and follow the field edge
Little Willis River 1	209.0 to 209.4	VA	Adjustment to avoid two waterbody crossings
Little Willis River 2	209.8 to 210.0	VA	Adjustment to avoid two waterbody crossings
High View Road	209.5 to 210.3	VA	Adjustment to reduce wetland impacts
Raines Tavern Road	212.9 to 213.8	VA	Adjustment to avoid two waterbody crossings
River Road	219.9 to 220.4	VA	Adjustment to avoid a wetland
High Bridge Road	220.6 to 221.5	VA	Adjustment to reduce the number of landowners crossed
South Genito Road	226.5 to 227.0	VA	Adjustment to avoid a wetland
Dutchtown Road	228.3 to 228.5	VA	Adjustment to avoid a cemetery
Little Creek	230.3 to 231.1	VA	Adjustment to avoid a waterbody crossing
Deep Creek	235.9 to 237.0	VA	Adjustment to minimize a wetland crossing
Winningham Road	237.2 to 237.6	VA	Adjustment to improve a road crossing and reduce clearing of mature trees
Woody Creek	238.7 to 240.6	VA	Adjustment to minimize a wetland crossing
Piney Green	240.4 to 240.9	VA	Adjustment to avoid an environmentally sensitive feature
Watson Creek Road	241.3 to 241.8	VA	Adjustment to avoid multiple crossings of a waterbody
Cellar Creek Road	241.5 to 243.1	VA	Adjustment to avoid existing buried utilities
Cottage Road	243.1 to 244.9	VA	Adjustment to avoid a planned stream mitigation bank
Green Gable Road	245.8 to 246.4	VA	Adjustment to straighten and optimize the pipeline route
Colonial Trail Highway	246.6 to 247.4	VA	Adjustment to increase distance from residences
White Oak Road	253.9 to 254.5	VA	Adjustment to reduce the pipeline length
White Oak Road	254.0 to 254.6	VA	Adjustment to meet landowner request to move pipeline out of field and avoid an existing pond
Gills Bridge Road	259.7 to 261.5	VA	Adjustment to avoid a gem mine and house as requested by a landowner and to reduce crossings of cultural resource sites
Rawlings Road	264.0 to 264.7	VA	Adjustment to reduce tree clearing
Brunswick Powerline	267.1 to 279.5	VA	Various adjustments to improve collocation with the existing DVP electric transmission line
Columbia Gas Transmission	288.6 to 289.8	VA	Adjustment to increase collocation with existing natural gas transmission pipeline
Emporia Power Line	292.8 to 293.3	VA	Adjustment to minimize impacts on an environmentally sensitive feature
Skippers Road	293.5 to 294.8	VA	Adjustment to avoid a planned rock quarry

TABLE 3.5-1 (cont'd)

Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes

Route Adjustment	Approximate Mileposts	State	Rationale
Taylors Mill Road	296.7 to 297.5	VA	Adjustment to minimize a wetland crossing
AP-2 Mainline			
Jacks Swamp	0.7 to 2.4	NC	Adjustment to minimize a wetland crossing
Hickory Tree Road	2.4 to 3.3	NC	Adjustment to reduce tree clearing
Big John Store Road	2.5 to 3.1	NC	Adjustment to avoid a cemetery
Big John Store Road	2.6 to 3.1	NC	Adjustment to avoid an environmentally sensitive feature and minimize impacts on forested land
Comwallis Road	3.7 to 4.2	NC	Adjustment to avoid a wetland
Geenex Route	4.2 to 5.3	NC	Adjustment to increase collocation with an existing DVP 115kV electric transmission line by 0.6 mile
Highway 125	13.2 to 15.9	NC	Adjustment to avoid a proposed solar facility and future quarry site
Grapevine Road	14.5 to 15.4	NC	Adjustment to avoid a future quarry development
Halifax Airport Solar	16.0 to 17.0	NC	Adjustment to avoid a solar lease
Quankey Creek	16.0 to 17.3	NC	Adjustment to avoid a proposed future development by the Halifax Airport Authority
Jacket Swamp	26.9 to 27.7	NC	Adjustment to avoid a conservation easement
Massengale Road	40.0 to 40.3	NC	Adjustment to avoid a future home site development
Wollett Mill Road	42.2 to 42.4	NC	Adjustment to avoid a cemetery
Deans Road	42.6 to 43.2	NC	Adjustment to optimize route based upon field survey data
Cambridge Drive	48.8 to 49.1	NC	Adjustment to increase distance from residences
Bone Lane	53.0 to 53.2	NC	Adjustment to avoid an aboveground structure
West Homes Church Road	63.9 to 64.3	NC	Adjustment to avoid a cultural resource site
Boykin Road	70.5 to 70.8	NC	Adjustment to avoid a wetland
Healthy Plains Church	71.6 to 72.2	NC	Adjustment to avoid an identified dump site with unknown exposure
Contentnea Creek	73.1 to 74.4	NC	Adjustment to optimize creek crossing angle
Contentnea Creek	73.5 to 74.0	NC	Adjustment to the Contentnea Creek HDD alignment
Hales Road	80.1 to 81.5	NC	Adjustment to avoid a waterbody crossing and minimize a wetland crossing
Old Beulah Road	84.0 to 84.5	NC	Adjustment to avoid a wetland
Davis Homestead Road	84.5 to 84.8	NC	Adjustment to avoid a cultural resource site and reduce wetland impacts
Firetower Road	91.4 to 91.6	NC	Adjustment to avoid a cultural resource site
Yelverton Grove Road	92.3 to 93.3	NC	Adjustment to connect to Smithfield M&R Station
Smithfield M&R	92.6 to 92.7	NC	Adjustment to improve approach to Smithfield M&R Station
Neuse River	98.0 to 99.0	NC	Adjustment to avoid an environmentally sensitive feature
Hannah Creek	100.9 to 101.3	NC	Adjustment to minimize impacts on an environmentally sensitive feature
Coats Road	103.5 to 103.8	NC	Adjustment to address a landowner request
NC-50 South	109.5 to 110.0	NC	Adjustment to avoid a wetland
Godwin Lake Road	110.1 to 110.7	NC	Adjustment to avoid a blueberry farm
Holly Grove Road	112.4 to 112.7	NC	Adjustment to avoid a wetland
Holly Grove Road	112.4 to 112.8	NC	Adjustment to reduce tree clearing
NC DOT Easement	113.9 to 114.4	NC	Adjustment to avoid a North Carolina Department of Transportation Nutrient Easement
Green Path Road	117.8 to 118.2	NC	Adjustment to reduce wetland impacts
Godwin Falcon Road	126.2 to 126.8	NC	Adjustment to reduce the pipeline length
Dunn Road	128.3 to 128.4	NC	Adjustment to improve a railroad crossing
Sisk Culbreth Road	129.4 to 129.7	NC	Adjustment to avoid existing structures

TABLE 3.5-1 (cont'd)

Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes

Route Adjustment	Approximate Mileposts	State	Rationale
Cape Fear River	130.3 to 131.2	NC	Adjustment to avoid an environmentally sensitive feature and increase collocation with an existing utility corridor. In addition, the adjustment has a reduction in length over the existing filed route
Jackie Lee Road	133.8 to 134.2	NC	Adjustment to reduce the pipeline length
Johnson Road	150.6 to 151.0	NC	Adjustment to avoid a solar facility
Duke Crossover 1	151.6 to 152.1	NC	Adjustment to avoid a large ditch
Duke Crossover 2	154.4 to 154.8	NC	Adjustment to comply with Duke Energy's right-of-way use guidelines
Chickenfoot Road	159.2 to 159.4	NC	Adjustment to comply with Duke Energy's right-of-way use guidelines
Little Marsh Swamp	162.0 to 164.8	NC	Adjustment to minimize a wetland crossing and parallel an existing utility corridor
Pin Oak Drive	165.9 to 167.2	NC	Adjustment to avoid a federally listed plant species
Great Marsh Church	168.3 to 169.3	NC	Adjustment to meet a landowner request
West Great Marsh Church Road	168.4 to 168.9	NC	Adjustment to avoid a cultural resource site
Rennert Road	171.5 to 172.3	NC	Adjustment to reduce the length of the pipeline and address a landowner request
Rennert Road	171.7 to 171.9	NC	Adjustment to optimize crossing of existing electric transmission line and avoid existing structure
McQueen Road	175.0 to 175.4	NC	Adjustment to avoid a wetland
Borrow Site	176.8 to 177.7	NC	Adjustment for a future borrow site
Evergreen Church Road	178.2 to 178.7	NC	Adjustment to follow a property boundary
Whistling Rufus Road	181.1 to 181.8	NC	Adjustment to reduce tree clearing
AP-3 Lateral			
Highway 186	9.9 to 10.3	NC	Adjustment to reduce tree clearing and optimize a railroad crossing
Hugo Road	13.3 to 13.5	VA	Adjustment to optimize a railroad crossing
DVP Electric Transmission Line	14.6 to 22.3	VA	Adjustment to improve collocation with the existing DVP electric transmission line
Cross Keys Road	20.5 to 21.5	VA	Adjustment to increase collocation with existing utility corridor
Newsome	22.5 to 23.0	VA	Adjustment to optimize route based upon field survey data
Grays Shop Road	23.7 to 24.1	VA	Adjustment to avoid a wetland
Thomaston Road	25.7 to 26.7	VA	Adjustment to reduce tree clearing and increase collocation with an existing linear utility corridor
Cypress Bridge Road	26.9 to 27.4	VA	Adjustment to follow a field edge per landowner request
Bishop Poquoson Road	28.6 to 28.9	VA	Adjustment to avoid a wetland
Sycamore Church Road	33.9 to 34.9	VA	Adjustment to follow property boundary
Highway 58	41.1 to 41.5	VA	Adjustment to address a landowner request
Elwood Road	42.8 to 45.9	VA	Adjustment to reduce tree clearing, increase collocation with an existing linear utility corridor, and reduce wetland impacts
Franklin	44.4 to 45.5	VA	Adjustment to avoid a conservation easement
OKelly drive	46.5 to 46.7	VA	Adjustment to optimize route based upon field survey data
Longstreet Lane	47.6 to 48.8	VA	Adjustment to improve collocation with an existing electric transmission line
Pioneer Road	49.3 to 50.4	VA	Adjustment to reduce the pipeline length and optimize a railroad crossing
Holland Road	50.8 to 51.6	VA	Adjustment to meet a landowner request
Pruden Boulevard	59.0 to 59.3	VA	Adjustment to avoid a future church
Deer Path Road	52.8 to 53.9	VA	Adjustment to avoid a planned rail yard and wildlife area at the request of the landowner

TABLE 3.5-1 (cont'd)			
Select Route Adjustments Incorporated into the Atlantic Coast Pipeline and Supply Header Project Routes			
Route Adjustment	Approximate Mileposts	State	Rationale
Deer Path Road	53.5 to 54.3	VA	Adjustment to avoid proposed future wildlife refuge
Kings Fork Road	55.6 to 55.9	VA	Adjustment to reduce tree clearing
Lake Point Road	59.0 to 60.2	VA	Adjustment to avoid a proposed future development
Lake Prince	60.6 to 61.4	VA	Adjustment to improve HDD crossing location
Godwin Boulevard	63.1 to 63.5	VA	Adjustment to improve a road crossing
Nansemond River	64.2 to 65.1	VA	Adjustment to improved crossing angle of Nansemond River
Nansemon Pullback	65.1 to 65.4	VA	Adjustment to avoid a tidal wetland
Nansemond Parkway	66.4 to 69.0	VA	Adjustment to reduce tree clearing and increase collocation with an existing linear utility corridor
Gateway	71.0 to 72.7	VA	Adjustment to avoid a wetland mitigation bank and mitigation site; includes the new Route 58 HDD. In addition, the adjustment has a significant reduction in length over the existing filed route
East Ditch	71.2 to 71.8	VA	Adjustment to minimize impacts on a salvage yard business. In addition, the adjustment has a reduction in length over the existing filed route
West Military Highway	71.3 to 71.8	VA	Adjustment to optimize crossing of West Military Highway and avoid Federal land crossing
Truitt Road	73.0 to 73.6	VA	Adjustment to optimize route based upon field survey data
Norfolk Western Railroad	76.0 to 76.1	VA	Adjustment to optimize a railroad crossing
Norfolk Southern	76.0 to 76.8	VA	Adjustment to avoid an environmentally sensitive feature
Galberry Road	77.5 to 77.9	VA	Adjustment to improve collocation with an existing electric transmission line
West Military Highway	68.0 to 68.4	VA	Adjustment to optimize crossing of West Military Highway and auto salvage yard
Hampton Roads Beltway	77.6 to 79.5	VA	Adjustment to optimize collocation with an existing linear utility corridor
Forest Cove Drive	79.7 to 80.3	VA	Adjustment to optimize collocation near existing electric transmission substation
South Military Highway	81.2 to 82.1	VA	Adjustment to optimize pipeline location near existing industrial facility and optimize crossing of South Branch Elizabeth River
AP-4 Lateral			
Governor Harrison Parkway	0.0 to 0.3	VA	Adjustment to improve connection to proposed electric generation facility
AP-5 Lateral			
Rogers Road	0.5 to 1.0	VA	Adjustment to improve connection to proposed electric generation facility
SUPPLY HEADER PROJECT			
TL-635			
Broad Run Road	21.2 to 21.9	WV	Adjustment to avoid side-slope workspace
Bates Run	29.7 to 29.8	WV	Adjustment to optimize crossing of South Fork Fishing Creek
Upper Run	31.0 to 31.8	WV	Adjustment to reduce side slope crossing
TL-636			
Hills Church Road	3.6 to 3.9	PA	Adjustment to reduce tree clearing and increase collocation

Note: Route adjustments in italics are located on NFS Lands.

3.6.1.3 ACP Compressor Station 2

Atlantic considered two sites for Compressor Station 2 in Buckingham County, Virginia; the currently proposed site and an alternative site located 1.9 miles to the southwest of the proposed site near the intersection of Midland Road and the existing Transco pipeline system. We received several comments that the operation of Compressor Station 2 would degrade air quality and impact residence around the proposed facility, and that an alternate site should be considered. We also received comments that the proposed location of Compressor Station 2 would affect the Norwood – Wingina and Warminster Historic Districts and the Yogaville Ashram. Thus, we evaluated the Midland Road site as a possible alternative. Figure 3.6.1-1 depicts the location of the proposed and alternate sites. A comparison of the environmental data on each site is provided in table 3.6.1-1.

TABLE 3.6.1-1

Comparison of Proposed Site and Midland Road Alternative Site for Compressor Station 2

Features	Unit	Proposed Site	Midland Road Site Alternative
Permanent easement	acres	12.9	13.1
Temporary construction workspace	acres	56.0	55.8
Additional miles of AP-1 mainline required	miles	0.0	1.1
Conservation easements	acres	0.0	0.0
Forested lands – Permanent	acres	12.8	10.6
Forested lands – Temporary	acres	36.1	38.8
Wetlands (NWI) – Permanent	acres	0.0	0.0
Wetlands (NWI) – Temporary	acres	0.0	0.0
Intermittent waterbodies	number	1	0
Perennial waterbodies	number	0	0
Prime Farmland – Permanent	acres	11.5	3.6
Prime Farmland – Temporary	acres	26.7	30.1
Noise Sensitive Areas (NSA) within 0.5 mile	number	9	10

The environmental impacts between the proposed site and the Midland Road Alternate site are similar; however, the alternative site would require additional pipeline and would increase the construction footprint of ACP. Further, our analysis in sections 4.9.9.1 and 4.11.1.3 concludes that operation of the compressor stations would not cause or contribute to a violation of the federal air quality standards; therefore, we do not believe health would be adversely affected or that the alternative site would be necessary for reasons of air quality or public health. Also, the Norwood – Wingina and Warminster Historic Districts are 4.5 and 5.9 miles from the proposed compressor station site, respectively, and the Yogaville Ashram is over 4.5 miles from the site. Therefore, these areas would not be affected by construction or operation of the facility, and moving the compressor station 1.9 miles to the southwest would not provide and measurable benefit. Considering these factors, we conclude that the Midland Road Alternative compressor station site does not offer a significant advantage, and we do not recommend it.

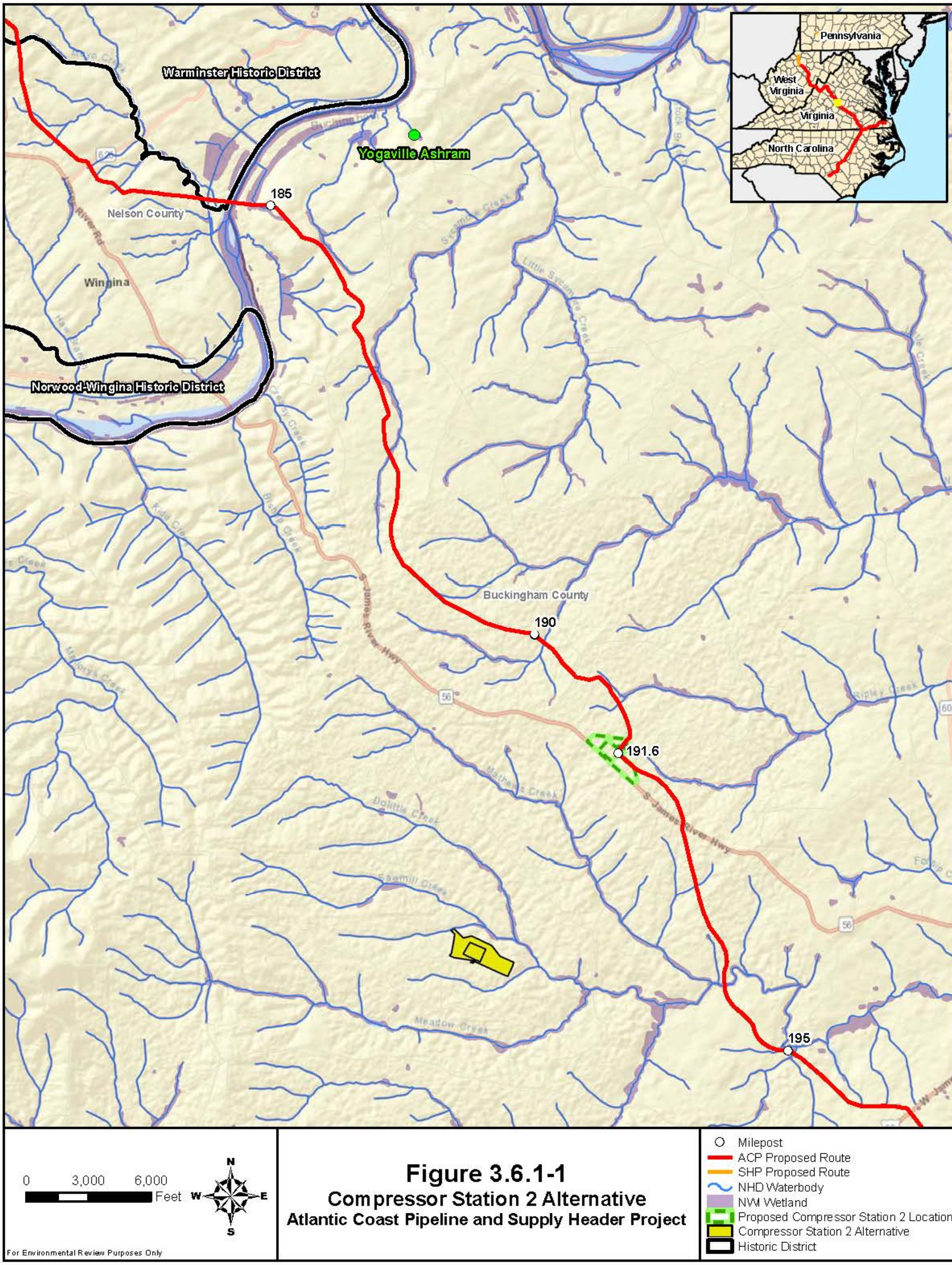


Figure 3.6.1-1
Compressor Station 2 Alternative
Atlantic Coast Pipeline and Supply Header Project

3.6.1.4 ACP Compressor Station 3

We did not receive any comments regarding alternative sites for Compressor Station 3. Based on our evaluation of the proposed site in section 4 of this EIS, we find it to be an acceptable location, and that the compressor station would not result in or contribute to significant environmental impacts. As such, no alternative sites were evaluated.

3.6.1.5 Electric-Driven Compressor Alternatives

Based on commentors concern regarding the need to reduce air emissions, we evaluated the feasibility of using electric motor-driven compressors as an alternative to the natural gas-driven compressors proposed for ACP. The electric power needed to run the electric-driven compressor units at Compressor Stations 1, 2, and 3 would be 32 MW, 28 MW, and 12 MW, respectively. To supply the electric power at each facility, an overhead single phase power line would need to be constructed to each compressor station. Based on the location of existing power lines near the proposed facilities, about 9.5 miles, 12 miles, and 3.5 miles of power lines would need to be constructed to Compressor Stations 1, 2, and 3, respectively. The local electric distribution companies that construct the power lines may also be required to construct 1- to 2-acre substations for each power line facility. This additional electric infrastructure would increase environmental impacts and impact landowners currently unaffected by ACP.

Use of electric-driven compressors, from the perspective of meeting Atlantic's emissions, was not considered environmentally superior to natural gas compressors in terms of reducing regional emissions. Although local air emissions from electric-driven compressors would be lower than those from natural gas-driven compressors, use of electric-driven compressors would result in a higher load on the electric power grid and higher emissions from the electric power generating stations. Additionally, the use of natural gas-driven compressors provides reliable, uninterrupted natural gas transmission because the fuel is continually supplied by the pipeline facility and would not be affected by an electrical outage at the compressor station. Considering these factors, we conclude that electric-driven compressor units would not offer a significant environmental advantage over the proposed gas-driven compressors.

3.6.2 Meter Stations and Valves

We did not evaluate alternative locations for M&R stations because their locations are largely determined by interconnections with other pipeline systems and delivery points, the facilities have a relatively small footprint, and we did not receive any alternative meter station site recommendations from stakeholders. Similarly, we did not evaluate alternative locations for valves because the locations of these facilities are based in part on PHMSA regulations, the facilities have a relatively small footprint, and we did not receive any alternative valve site recommendations from stakeholders.

3.6.3 Communication Towers

We did not evaluate alternative locations for communication towers because their locations are largely determined by the location of other proposed or existing aboveground facilities, the facilities have a relatively small footprint, and we did not receive any alternative site recommendations from stakeholders.

4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and discusses the environmental consequences of the proposed ACP and SHP. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife; aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; and cumulative impacts.

The environmental consequences of constructing and operating the projects would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long-term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the projects. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

Atlantic and DETI, as part of their proposals, developed certain mitigation measures to reduce the impact of ACP and SHP. In some cases, we determined that additional mitigation measures could further reduce the projects' impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also included in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in the Certificate the Commission may issue to Atlantic and DETI for these projects.

The conclusions in the EIS are based on our analysis of the environmental impact and the following assumptions:

- Atlantic and DETI would comply with all applicable laws and regulations;
- Atlantic would comply with LRMP direction for the portion of ACP that crosses NFS lands;
- the proposed facilities would be constructed as described in section 2 of the EIS; and
- Atlantic and DETI would implement the mitigation measures included in their applications and supplemental submittals to the FERC and cooperating agencies, and in other applicable permits and approvals.

4.1 GEOLOGY

4.1.1 Regional Geology and Physiography

ACP and SHP would be located within five physiographic provinces, or large areas with characteristic landforms and similar geology, including:

- the Appalachian Plateau Province in southeast Pennsylvania and West Virginia (AP-1 MPs 0 to 74 and the entire SHP TL-635 and TL-636 looplines);
- the Valley and Ridge Province in West Virginia and Virginia (AP-1 MPs 74 to 148);

- the Blue Ridge Province in central Virginia (AP-1 MPs 148 to 168);
- the Piedmont Province in eastern Virginia and North Carolina (AP-1 MPs 168 to 300; AP-2 MPs 0 to 6 and MPs 37 to 42; AP-3 MPs 0 to 0.5; and the entire AP-4 and AP-5 laterals); and
- the Coastal Plain Province in south-central Virginia and North Carolina (AP-2 MPs 6 to 28, MPs 29 to 37, and MPs 42 to 183; and AP-3 MPs 0.5 to 83).

In addition, as discussed in the following sections, ACP would traverse karst terrain through the Valley and Ridge Province in West Virginia and Virginia, abandoned mines in the Appalachian Plateau Province in West Virginia, and steep slopes in the Appalachian Plateau Province, Valley and Ridge Province, Blue Ridge Province, and Piedmont Province in West Virginia. SHP would traverse abandoned mines in Pennsylvania and steep slopes in Pennsylvania and West Virginia. Aboveground facilities would be constructed within the same geologic setting as the adjacent pipeline facilities and, therefore, are not considered separately in the remainder of section 4.1 except where noted.

The Appalachian Plateau Province forms the northwestern flank of the Appalachian Mountains from western New York to northern Alabama and is characterized by elevated, planar sedimentary rocks with differing levels of stream dissection. The Appalachian Plateau Province is divided into seven sections; the Kanawha and Allegheny Mountain Sections are the two sections crossed by ACP and SHP. The Kanawha Section is an unglaciated plateau with moderate to high relief (300 feet to 800 feet). The Allegheny Mountain Section consists of broad, rounded ridges separated by broad valleys. The approximate elevation of the Appalachian Plateau Province near ACP ranges from 980 feet above mean sea level (AMSL) to 4,200 feet AMSL and near SHP ranges from 740 feet AMSL to 1,570 feet AMSL. The boundary between the Appalachian Plateau Province and the Valley and Ridge Province is the Allegheny Front, an area of transition where the horizontal bedrock of the Appalachian Plateau gives way to the folded bedrock of the Valley and Ridge Province (Fenneman, 1938; Fenneman and Johnson, 1946; USGS, 1997a; USGS, 2014).

The Valley and Ridge Province consists of folded sedimentary bedrock that form a long and narrow belt of parallel mountain ridges and valleys trending in a northeast to southwest direction. Differential weathering of these folds and faults has produced the distinctive repeating landscape of ridges and valleys. Resistant sandstone or conglomerate forms the top and upper portion of the ridges, while the lower flanks of the ridges and the valleys are underlain by shale and carbonate bedrock that have developed into karst terrain. ACP crosses the Middle Section of the Valley and Ridge Province, also called the Great Valley. The Middle Section is characterized by a very broad lowland and gently rolling hills on the north side of the valley eroded into shales and siltstones, and a flatter landscape with a lower elevation on the south side of the valley developed on limestone and dolomite (Fenneman, 1938; Fenneman and Johnson, 1946; USGS, 1997a, USGS, 2014). The approximate elevation of the Valley and Ridge Province near ACP range from 1,320 feet AMSL on valley floors to 4,150 feet AMSL at ridge tops. In the area of ACP, the eastern edge of the Valley and Ridge Province is bordered by the Blue Ridge Province.

The Blue Ridge Province is a narrow zone of mountain ridges trending in a northeast to southwest direction, inclusive of the Blue Ridge Mountains. The Blue Ridge Province is comprised of Precambrian granite and gneiss, late Precambrian to Cambrian Era meta-basalt, and Cambrian Era limestone, conglomerate, and shale. While the Blue Ridge Province contains the highest peaks in the Appalachian Highlands, the proposed ACP facilities cross the Northern Section of the Blue Ridge Province, which is lower in elevation than the Southern Section (USGS, 1997a; USGS, 2014). The approximate elevation of the Blue Ridge Province near ACP ranges from 700 feet AMSL to 2,800 feet AMSL. The eastern edge of the Blue Ridge Province is bordered by the Piedmont Province.

The Piedmont Province Uplands Section is characterized by gently rolling topography, underlain by saprolite[1] or crystalline bedrock, with a scarcity of bedrock outcrops (Fenneman, 1938, Fenneman and Johnson, 1946, USGS, 1997a, USGS, 2014). The elevation of the Piedmont Province near ACP ranges from 60 feet AMSL to 1,350 feet AMSL. The eastern boundary of the Piedmont Province bordering the Coastal Plain Province is identified as the Coastal Plain unconformity or Fall Line,[2] a geologic escarpment where the igneous and metamorphic bedrock of the Piedmont Province meets with the easterly to southeasterly deposited wedge of Cretaceous Era and younger siliciclastic sediments and carbonates of the Coastal Plain Province.

The Coastal Plain Province occupies relatively lower elevations of the eastern interior of the United States and is characterized as having relatively low relief. The Central Lowland Province around ACP is further comprised of two sections, the Embayed Section and the Sea Island Section. The Embayed Section (approximately 130 miles of the AP-2 mainline and AP-3 lateral) is characterized by large bays, estuaries that may extend to the Fall Line, and barrier islands. The Sea Island Section (approximately 124 miles of the AP-2 mainline) is characterized by a smooth coastline with relatively small estuaries that lack (Horton and Zullo, 1991; USGS, 1997a). The approximate elevation of the Coastal Plain Province near ACP ranges from 0 to 240 feet AMSL.

4.1.2 Local Geology

4.1.2.1 Surficial/Bedrock Geology

Surficial geology has not been mapped in detail in the areas crossed by ACP and SHP. National-scale mapping depicts unconsolidated surficial deposits near ACP as colluvium derived from the weathering and breakdown of the underlying bedrock, alluvium, and coastal plain sediments and in SHP as colluvium (Soller et al., 2009). Some surficial geological material, including alluvium and colluvium were mapped during the Order 1 Soil Survey on NFS lands and is discussed further in section 4.1.6.

Various geologic deposits are located within trench depth along the ACP and SHP pipeline routes, including unconsolidated material, metamorphic and igneous bedrock units, and sedimentary bedrock units (appendix O). The occurrence of karst geology is an important consideration for ACP and SHP, and is discussed separately in section 4.1.2.3.

The AP-1 mainline would cross Precambrian to Cambrian-Era igneous and metamorphic bedrock, Paleozoic and Mesozoic Era sedimentary bedrock including sandstone, siltstone, shale, limestone, and dolomite, and Cenozoic Era unconsolidated sand, gravel, and alluvium as the alignment traverses from northwest to southeast. The AP-2 mainline crosses Cenozoic and Mesozoic Era unconsolidated surficial deposits, except between MPs 30 and 60 where the AP-2 mainline is west of the Fall Line where the AP-2 mainline crosses sandstone, and Late Precambrian and Paleozoic Era igneous and metamorphic rocks. The AP-3 lateral would cross Cenozoic Era unconsolidated sand, gravel, alluvium, and peat. The AP-4 lateral would cross Precambrian to Cambrian Era igneous and metamorphic rocks and Cenozoic unconsolidated gravel. The AP-5 lateral would cross Proterozoic Eon metamorphic rocks and Cenozoic Era unconsolidated gravel (Cardwell et.al, 1968; North Carolina Geological Survey [NCGS], 1985; Virginia Division of Geology and Mineral Resources, 1993). Shallow bedrock less than 5 feet below ground surface has been reported on 152.7 miles of ACP facilities, of the total 603.8 miles. Approximately 48 percent (73.9 miles)

1 Saprolite is soft, decomposed bedrock rich in clay and formed in place by chemical weathering.

2 A Fall Line is a geomorphic boundary or break between hard crystalline bedrock and soft coastal plain sediments, often identified by waterfalls and rapids in rivers.

of the shallow bedrock crossed ACP facilities is considered lithic (competent or hard). Therefore, approximately 75 percent of ACP facilities would not encounter competent bedrock.

In general, the TL-635 pipeline loop would cross Paleozoic Era sedimentary rock including sandstone and siltstone and the TL-636 pipeline loop would cross Paleozoic Era sedimentary rock including limestone and shale (Berg et al., 1980). Shallow bedrock less than 5 feet below ground surface has been reported on 33.7 miles of SHP facilities, of the total 37.5 miles. Approximately 65 percent (22.0 miles) of the shallow bedrock crossed by SHP facilities is considered lithic.

Construction and operation of ACP and SHP would have minor effects on existing geologic conditions in the area. Effects from construction could include disturbance of the natural topography along the pipeline rights-of-way or adjacent aboveground facilities due to trenching, blasting, and grading activities. The primary impacts would be limited to construction activities and would include temporary disturbance to slopes within the rights-of-way resulting from grading and trenching operations and alteration of karst terrain. Atlantic's and DETI's proposed remediation measures would attempt to restore slopes and karst terrain to existing conditions to the extent practicable. Following construction, Atlantic and DETI would restore all areas as close as practicable to their preconstruction contours. Grading and filling may be required to permanently create a safe and stable land surface to support aboveground facilities; however, these impacts would be minor and localized to the immediate area of the aboveground facilities. Impacts on groundwater and associated karst features are discussed in section 4.3.1.7.

4.1.2.2 Shallow Bedrock and Blasting

Bedrock present within 5 feet of the surface are shallow, and within the anticipated trench depth. Areas with shallow bedrock classifications were identified using the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff, 2016). Atlantic and DETI would attempt to excavate the trench using rock trenching machines, rock saws, hydraulic rams, or jack hammers, followed by backhoe excavation. However, blasting may be necessary where hard, non-rippable bedrock occurs as outcrop or where shallow soils are underlain by hard bedrock. Blasting may also be necessary to fracture the surficial rock during grading activities.

SSURGO data identifies that lithic (hard) bedrock is present on 73.9 miles (12 percent) of ACP and 22.1 miles (59 percent) of SHP, which may require blasting or other special construction techniques (table 4.1.2-1). Additionally, mapped locations of shallow bedrock combined with the SSURGO data show that blasting may be required along 152.7 miles (25 percent) of ACP and 34.0 miles (91 percent) of SHP.

If blasting does become necessary, it typically involves a small scale, controlled, rolling detonation procedure resulting in limited ground upheaval. These blasts do not typically result in large, aboveground explosions (see section 2.3.2.4). Any required blasting would be conducted in accordance with all federal, state, and local regulations, with special precautions during fire season on NFS lands. Blasting of the bedrock could potentially damage nearby pipelines and other structures and could initiate landslides, or ground subsidence over underground mines. Blasting of bedrock, particularly karst bedrock, could create fractures in the rock, temporarily affecting local groundwater flow patterns and groundwater yield of nearby wells and springs around the blast site, and affecting their water quality by a temporary increase in turbidity levels shortly after blasting.

TABLE 4.1.2-1

Potential Areas of Shallow Bedrock Crossed by the Atlantic Coast Pipeline and Supply Header Project [a]

Project/State or Commonwealth/County or City	Total Crossing Length (miles)	Bedrock Type [b] Lithic (miles)	Paralithic (miles)
ATLANTIC COAST PIPELINE			
West Virginia			
Harrison County	1.1	0.8	0.2
Lewis County	19.9	1.6	14.0
Upshur County	22.2	6.8	12.0
Randolph County	30.3	16.9	8.5
Pocahontas County	25.3	8.6	12.5
West Virginia Subtotal	98.8	34.7	47.2
Virginia			
Highland County	11.0	7.1	0.0
Bath County	22.6	10.2	0.4
Augusta County	56.1	8.5	9.8
Nelson County	27.6	9.7	2.5
Buckingham County	27.8	2.7	9.8
Cumberland County	9.1	0.1	2.5
Prince Edward County	5.2	0.0	2.0
Nottoway County	23.5	0.1	4.2
Dinwiddie County	11.8	0.0	0.0
Brunswick County	23.0	0.8	0.0
Greensville County	18.7	0.2	0.0
Southampton County	26.3	0.0	0.0
City of Suffolk	33.3	0.0	0.0
City of Chesapeake	11.3	0.0	0.0
Virginia Subtotal	307.2	39.3	31.1
North Carolina			
Northampton County	22.3	0.0	0.0
Halifax County	24.4	0.0	0.0
Nash County	32.0	0.0	0.0
Wilson County	12.0	0.0	0.3
Johnston County	38.1	0.0	1.1
Sampson County	7.8	0.0	0.0
Cumberland County	39.7	0.0	0.0
Robeson County	22.4	0.0	0.0
North Carolina Subtotal	198.6	0.0	1.4
Subtotal	604.5	73.9	79.8
SUPPLY HEADER PROJECT			
Pennsylvania			
Westmoreland County	3.9	2.0	0.7
Pennsylvania Subtotal	3.9	2.0	0.7
West Virginia			
Harrison County	0.6	0.0	0.7
Doddridge County	22.2	19.8	1.1
Tyler County	0.8	<0.1	0.7
Wetzel County	10.0	0.0	9.0
West Virginia Subtotal	33.6	20.1	11.5
Subtotal	37.5	22.1	12.2
TOTAL	642.0	96.0	92.0

[a] Based on analysis of the SSURGO database (Soil Survey Staff, 2016).

[b] Paralithic refers to “soft” bedrock that will not likely require blasting during construction. Lithic refers to “hard” bedrock that could require blasting or other special construction techniques during installation of the proposed pipeline.

Atlantic and DETI have prepared a project-specific *Blasting Plan* that describe how blasting would be conducted to ensure safety and protect nearby facilities including existing pipelines, residences, and wells and springs (see table 2.3.1-1). The main elements of the *Blasting Plan* include the following:

- Evaluate nearby areas to blasting to assess any potential hazard to people and damage to property.
- Contact the owners of pipelines, utilities, other infrastructure, and buildings within proximity to the work area at least 48 hours prior to blasting.
- Contact landowners to determine the location of private water wells and water supply springs within 150 feet (500 feet in karst terrain) of approved construction workspaces, including near locations where blasting may be required. Pending landowner permission, preconstruction well testing would be conducted to evaluate water quality and yield. If construction has adversely affected the water quality and/or yield of a well, Atlantic and DETI would conduct post-construction testing and provide an alternative water source or a mutually agreeable solution, which could include restoring the supply to preconstruction conditions or providing a permanent replacement source of potable water.
- Request authorization from landowners to inspect any aboveground structures within 150 feet of the right-of-way (farther if required by local or state regulations) before and after blasting.
- Design and control the blast to focus the energy of the blast to the rock within the trench and to limit ground accelerations outside the trench. Atlantic and DETI would avoid blasting within 15 feet of an existing in-service pipeline except in the case where precise, pre-blasting measurement have been taken to ensure that blasting would not impact the pipeline and the action has been specifically authorized by Atlantic or DETI.
- Measure peak particle velocity and decibel readings at nearby structures during blasting, and protect them from potential fly rock by using blasting mats or soil padding on the right-of-way.
- Conduct and document post-blasting inspections and repair damages sustained through blasting and/or compensate the landowner.

After the pipeline is installed and appropriate padding is placed around the pipe, blast rock would be returned to the trench to the top of the original bedrock elevation. Large rock not suitable for use as backfill would be hauled off to an approved disposal location or used as beneficial reuse, per landowner or land management agency approval and as required by permit requirements.

We received comments concerning the potential for blasting to cause landslides or damage to property close to the construction corridor, or further away when dense igneous or metamorphic rocks are present. Atlantic and DETI would mitigate potential blasting-related impacts by implementing specific measures detailed in the *Blasting Plan*, including some or all the following measures, as practical:

- Using safety berms at the base of each shot to minimize downslope movement of shot material after initiation;
- Using catch berms at the base of the hill to reduce the potential for rolling material to leave the right-of-way;

- Using berms on the edge of the right-of-way to control rolling material within the right-of-way;
- Initiating shots from lowest elevation first;
- Conducting blast tests on areas without slopes with a reduced powder factor to determine a charge that would fracture the material, while minimizing rock disturbance; however, higher vibrations and tight digging may be required with this measure;
- Reducing the pounds of explosive per delay by decking the holes; and
- In instances where multiple trench shots are necessary, limiting the removal of shot material until all shots are complete, which helps hold subsequent shots in place.

Our review of Atlantic's and DETI's *Blasting Plan* concludes that it is acceptable. By conducting blasting in accordance with the project-specific *Blasting Plan* and applicable state and local regulations, impacts on geologic resources, and nearby residences and facilities would be avoided or adequately minimized. Impacts from geologic hazards would likewise be minimized. Impacts associated with blasting at waterbody crossings are discussed in section 4.3.2.6.

4.1.2.3 Karst Geology

Land subsidence can damage underground and aboveground facilities located above the subsidence area. Two sources of potential land subsidence were considered for ACP and SHP: sinkhole formation in karst areas, and underground mine collapse. Mine subsidence and mitigation are discussed in section 4.1.4.5.

Karst terrain and physiography result from the dissolution of soluble bedrock, such as limestone, dolomite, marble, or gypsum, through the circulation of groundwater that has become slightly acidic as a result of atmospheric carbon dioxide being dissolved in the water. Karst terrain is characterized by the presence of sinkholes, caverns, an irregular "pinnacled" bedrock surface, and springs. These features could present a hazard to the pipeline both pre-and post-construction due to cave or sinkhole collapse, and can also provide direct conduits from the ground surface to the groundwater, increasing the potential for groundwater contamination. Any landscape that is underlain by soluble bedrock has the potential to develop karst physiography and landforms. The National Karst Map (Weary and Doctor, 2014) indicates that the proposed ACP route between AP-1 MPs 60 and 154 would cross approximately 59.8 miles of areas mapped as potential karst terrain in Virginia and West Virginia. As discussed in Atlantic's Karst Survey Report (GeoConcepts, 2017), additional karst features, including cave entrances and sinkholes were identified outside the mapped karst terrain coverage in the National Karst Map. Identification of these additional features brings the total crossing length over potential karst terrain to approximately 71.3 miles between AP-1 MPs 59 and 154. In addition, approximately 1.1 miles of SHP TL-636 loopline in Westmoreland County, Pennsylvania is in an area that has the potential to contain karst features.

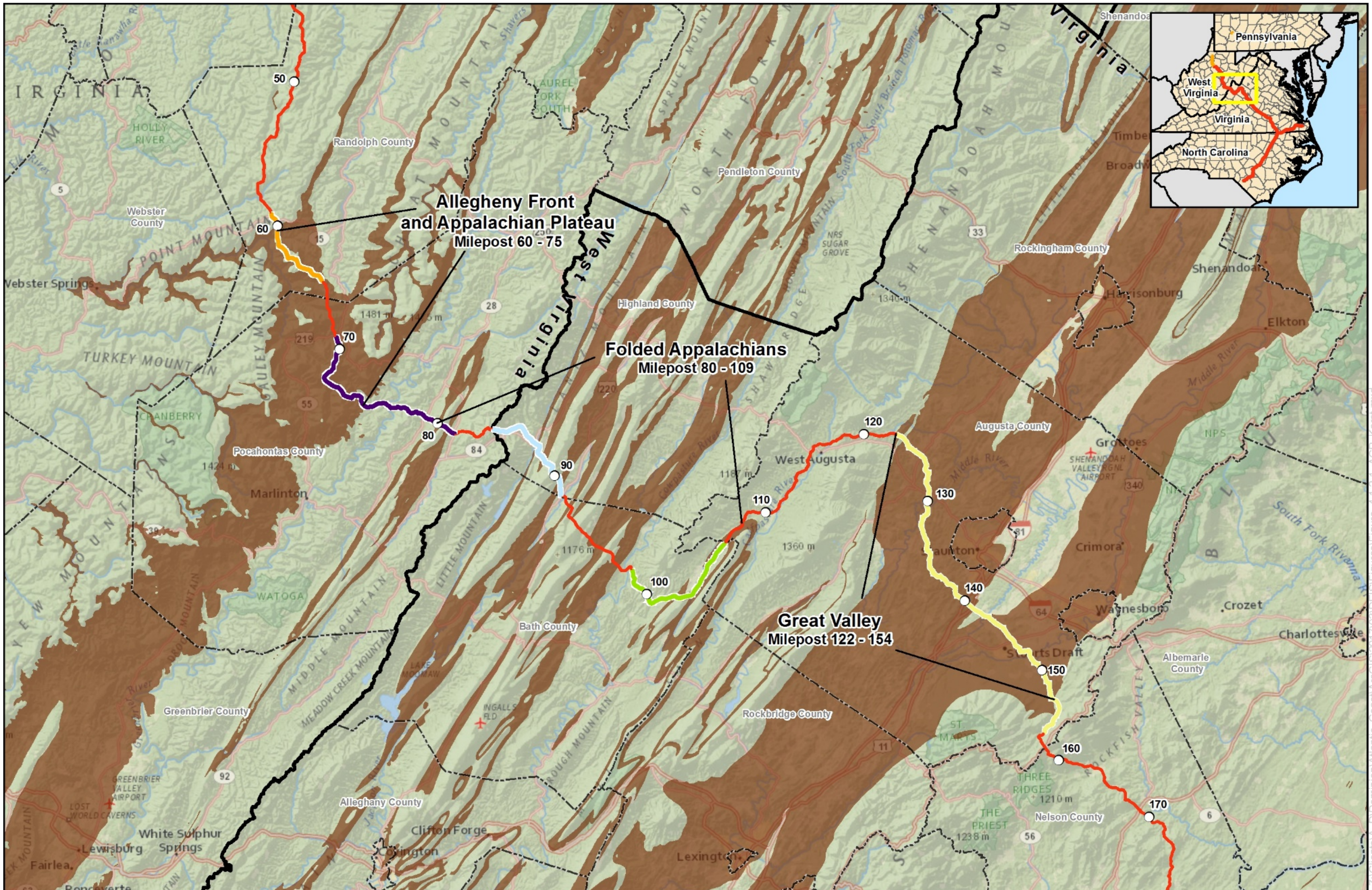
We received numerous comments from affected landowners, the Virginia Cave Board, the VDCR, local governmental units, Highland County Cave Survey, and other stakeholders expressing concerns related to construction and operation of ACP in karst sensitive areas of West Virginia and Virginia. Additionally, data received from the USGS (Weary and Doctor, 2014); VDCR; the Virginia Speleological Society (VSS); West Virginia Speleological Society; and the Virginia Department of Mines, Minerals, and Energy (VDMME) were used in characterizing karst conditions along the proposed ACP alignment. Most of these issues concerned the impairment of cave systems, springs, and wells; construction methods triggering sinkhole development; interception of subterranean drainage; and operational safety in karst areas. The potential for ACP to impact caves, wells, and springs relates primarily to groundwater quality, and are discussed in section 4.3.1.7. The potential for ACP to trigger sinkhole development, and the safety of operating the proposed facilities in karst sensitive areas are discussed in the sections below, which summarize Atlantic's *Karst Mitigation Plan* (see appendix I). The *Karst Mitigation Plan* presents a geological overview of the karst terrain traversed by ACP; preconstruction field surveys and assessment, including geophysical surveys; construction monitoring protocols; and mitigation and conservation procedures.

The density and type of karst features present in the ACP area are primarily related to the presence, thickness, and permeability of geologic units overlying the carbonate bedrock. Fracture systems within the bedrock are commonly manifested in the surface topography as lineaments. Additionally, because the flow of water through the fracture system network enhances the dissolution of soluble bedrock, karst features commonly occur in greater density along fracture and joint planes.

The most prominent type of karst features in the ACP area are sinkholes, which comprise the greatest potential geohazard risk to any type of construction in karst terrain. Other karst features inventoried in the ACP area include caves and springs. Potential impacts from sinkholes include property damage and injury from sinkhole collapse; and contamination of water resources by rapid infiltration of contaminants from the land surface into the groundwater flow system. Sinkholes can also contribute to flooding if their natural drainage capacity becomes impeded. Sinkholes fall into two broad categories: cover-collapse sinkholes and cover-subsidence sinkholes. Cover subsidence sinkholes are the more common sinkhole type in the ACP project area; cover-subsidence sinkholes form from the raveling of soil fines from the soil overburden into solution channels in the bedrock. The resulting voids from this process are filled gradually over time with the surrounding soil materials (a process called piping), and form a noticeable depression on the land surface. This process is slower in areas where the overlying unconsolidated material is thick or contains more clay. This natural process can be exacerbated by disturbances such as:

- an increase in water flow or redirection of overland surface water flow (for example, due to surficial grading) or subsurface flow that could accelerate the raveling of soil fines;
- removal of vegetative cover and topsoil (e.g., stripping or grubbing), which can reduce the cohesive strength of soils; and
- sudden decrease in the water table elevation (e.g., due to drought, over-pumping of wells, or quarry dewatering), which decreases the natural buoyancy of the water supporting a soil plug in a conduit, and may result in rapid and catastrophic soil collapse.

Based on the National Karst Map coverage provided by Weary and Doctor (2014) and topographic feature analysis that identified karst features outside the mapped coverage in the National Karst Map, the proposed ACP mainline in West Virginia and Virginia would cross total of approximately 71.3 miles of potential karst terrain between approximate AP-1 MPs 59 and 154. Additionally, this evaluation determined that approximately 1.1 miles of SHP TL-636 pipeline loop in Westmoreland County, Pennsylvania is in an area that has the potential to contain karst features. The remaining areas crossed by ACP and SHP were determined not to have the geologic conditions necessary for significant karst development. While some geologic units in the Coastal Plain Province appear on the National Karst Map (Weary and Doctor, 2014), these areas are underlain by unconsolidated to poorly consolidated calcareous or carbonate rocks that are generally not prone to formation of caves or subterranean voids. A total of three major distinct provinces of karst geology will be traversed by ACP as described below and illustrated in figure 4.1.2-1 (from northwest to southeast):



0 5 10 Miles	N S E W

For Environmental Review Purposes Only

Figure 4.1.2-1
Karst Geology Along the Atlantic Coast Pipeline Route
Atlantic Coast Pipeline and Supply Header Project

○ Milepost
ACP Proposed Route
Potential Karst (Weary and Doctor, 2016)
County Boundary
State Boundary

Karst Field Surveys Completed
MP 59.2 - MP 65.4
MP 69.2 - MP 81.2
MP 83.9 - MP 91.3
MP 98.3 - MP 106.7 (Discontinuous Survey Coverage)
MP 122.9 - MP 156.7 (Discontinuous Survey Coverage)

Source: Z:\Clients\A_D\Dominion\Atlantic_Coast\ArcGIS\2017\03\DEIS\Figures\Figure_4.1.2-1_ACP_Karst.mxd
Date: (5/10/2017)

1. The Allegheny Front and Appalachian Plateau province encompasses Pocahontas and Randolph Counties, West Virginia from approximate AP-1 MPs 60 to 75. This province generally exhibits intensive, mature karst development and high density of karst features. Steep groundwater hydraulic gradients have enhanced cavern development where carbonate formations are exposed along mountain flanks. Features include linear cave networks, conduit flow, disappearing and subterranean streams, and steep-walled, open throat sinkholes, known as swallets.

2. The Folded Appalachian Subsection of the Valley and Ridge province encompasses the eastern portion of Pocahontas County, West Virginia, all of Bath and Highland Counties, and western Augusta County, Virginia, and extends from approximate AP-1 MPs 80 to 109. Globally significant cave systems occur within the Folded Appalachian Subsection, including the caves of Burnsville Cove with approximately 100 km of mapped subterranean passages. ACP traverses different areas of karst development through this subsection, where erosion has exposed the limbs of folded carbonate formations.

3. The Great Valley subsection of the Valley and Ridge physiographic province from approximate AP-1 MPs 122 to 154 with Little North Mountain on the west and the Blue Ridge on the east. Most of the proposed alignment in Augusta County, Virginia is located within this province. The karst terrain of this subsection is characterized by numerous circular to oval-shaped sinkholes, ranging in size from a few to several hundred feet in diameter, and the presence of caves and large springs. In the eastern portion of August County, the karst terrain has been buried beneath a mantle of Paleogene to Quaternary Epoch alluvium shed off from the mountains to the. The numerous shallow broad sinkholes in this area are characteristic of the relative thicker unconsolidated material overlying the carbonate bedrock.

Atlantic retained GeoConcepts Engineering, Inc. (GeoConcepts) to conduct a desktop data review to identify known karst features along the proposed pipeline routes within the areas discussed above, followed by a field survey of the accessible areas. The purpose of this assessment was to locate and delineate surface karst features, particularly those with subsurface connections to groundwater (e.g., open-throat sinkholes, karst windows, cave entrances, abandoned wells, and sinking streams) and areas that could impact pipeline integrity (e.g., collapse sinks and caves within 15 feet of the ground surface). The results of this effort to date have been summarized in a Karst Survey Report (GeoConcepts, 2017). The assessment of karst conditions was conducted in three phases, described as follows:

1. Existing Data Review, Remote Sensing, and Analysis. GeoConcepts used readily available published information to provide geological context, and employed multiple datasets to conduct a desktop evaluation of karst features within the area of interest. Data sources include U.S. and state geological surveys, cave surveys, aerial photographs, USGS 7.5-minute topographic coverage, and Light Detection and Ranging (LiDAR) data, where available. The area of interest was subdivided into two sections: 1) 300-foot-wide corridor, which extends 150 feet from either side of the centerline, to be surveyed in the field; and 2) a 0.5-mile-wide Karst Review Area (KRA), extending 0.25 mile from either side of the proposed centerline. Features identified in the data review include:

    a. 300-foot-wide Corridor Closed Depressions/Features (cCDs): any closed depression located within or adjoining the 300-foot-wide corridor, or receiving drainage from the corridor. These were the only karst features that were delineated, documented, and recorded;

b. suspect Closed Depressions (sCDs): any closed depression occurring within the 0.5-mile-wide KRA centered on the proposed centerline; and

c. cave entrance locations.

2. Field Survey. GeoConcepts conducted the field survey where they had secured landowner permission to locate/verify surface karst features identified in the desktop review, as well as uncatalogued or previously unidentified surface karst features, that fall within a 300-foot-wide survey corridor centered on the proposed centerline. However, if observed or mapped karst features received drainage from the proposed pipeline work area then these features were delineated to the extent possible, and included in the assessment. The field survey focused particularly on features with high potential to serve as pathways to groundwater, such as sinkholes, cave entrances, dry runs, and sinking streams; a discussion of Atlantic's field survey and results is provided below.

3. Data Analysis. Each karst feature identified in the field was evaluated with respect to the following ranking criteria:

   a. located on or immediately adjacent to the proposed trench;

   b. presence of an open conduit leading into the subsurface;

   c. drainage characteristics (i.e., the presence of clear-cut drainage leading into the structure); and

   d. evidence of active soil raveling, tension cracks, or collapse.

These criteria were subsequently used to establish an individual risk ranking for each feature, defined as follows: High Risk is indicated by the presence of at least two of the ranking criteria, Moderate Risk by the presence of one, and Low Risk by the absence of all.

Existing Conditions—Data Review, Field Survey Results, and Stakeholder Input

This section characterizes the karst conditions along the route based on GeoConcepts' (2017) data review and field surveys, supplemented by information from various reports and correspondence received from stakeholders. Figure 4.1.2-1 illustrates the locations for the surveyed segments. Note that, of the 71.3 miles of the ACP alignment that was determined to cross potential karst terrain, only 62.3 miles could be surveyed because of lack of permission from landowners. The results of the data review and field surveys to date for each segment are summarized by county in table 4.1.2-2.

Table 4.1.2-3 summarizes the results of the risk rank analysis that was conducted for each karst feature that was identified by GeoConcepts (2017) in the field survey. The features are classified as either point or area features, which both include sinkholes and caves. Additionally, point features may include springs. Using these data, as well as supplemental information and stakeholder input, karst conditions are summarized by county, moving from the northwest to the southeast, in the following paragraphs.

As discussed above, subsurface fracture systems within the bedrock are commonly manifested in the surface topography as lineaments. Groundwater flow through the fracture system network enhances the dissolution of soluble bedrock, and karst features commonly occur in greater density along fracture and joint planes. An analysis of fracture lineaments aids in the identification of concentrated karst, and when coupled with existing dye trace studies can be utilized to extrapolate groundwater flow through a mature karst system from construction work spaces to area receptors such as caves, wells and springs. Atlantic would complete a fracture trace/lineament analysis utilizing remote sensing platforms (aerial photography and LiDAR), along with results of existing dye trace studies; the results of this analysis have not yet been provided for our review. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, the results of the fracture trace/lineament analysis utilizing remote sensing platforms (aerial photography and LiDAR), along with the results of existing dye trace studies. Atlantic should provide the results of this analysis on a composite map(s), illustrating surficial karst features with the potential for intersecting shallow interconnected karst voids and cave systems over a wide area; specifically, between the pipeline and nearby water receptors (i.e., public water supply wells, municipal water supplies, private wells, springs, caves systems, and to surface waters receiving discharge).**

Randolph County, West Virginia (Allegheny Front and Appalachian Plateau). GeoConcepts' (2017) data review identified 26 cCDs, two of which were determined to be associated with abandoned strip mines rather than karst. Their literature review also identified 10 cave entrances within the KRA but, based on topographic analysis of 1 meter LiDAR, none were determined to receive drainage from the 300-foot-wide corridor. Approximately 87 percent of the proposed alignment in Randolph County was field surveyed owing to restrictions in landowner permission. In the area that was surveyed, 29 point features and 9 area features were identified that are located within, adjoin, or receive drainage from the 300-foot-wide corridor. Eight of these were springs and the remainder were sinkholes. Two of the springs and six of the sinkholes were ranked as high risk.

Mapping and water dye tracing test results for the Upper Elk River Basin in Randolph and Pocahontas Counties summarized in Jones (1997) indicate the development of mature karst conditions including the development of an extensive subsurface drainage system around approximately AP-1 MPs 60 to 70.

We received comments on the draft EIS regarding the proposed crossing of Mingo Run and the potential for impacting with the Simmons-Mingo cave system. The Mingo Run Valley has been assessed by remote sensing and review of available data. Karst field surveys did not encounter any surface features between AP-1 MPs 65.0 and 65.7. Dye trace studies have confirmed a westward underground water flow between the Simmons Caves and the cave stream in the Simmons-Mingo cave system. Electrical resistivity imagery (ERI) surveys are planned for this area in 2019, prior to construction, to evaluate the depth to bedrock voids and determine if any subsurface fractures are present that could be affected by blasting, resulting in stream diversion. Therefore, to ensure that this stream crossing and cave system are protected, **we recommend that:**

- **<u>Prior to construction, but following tree clearing</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, the results of the ERI studies along with any proposed construction modifications or alignment shifts to avoid impacts on Mingo Run and the Simmons-Mingo cave system.**

TABLE 4.1.2-2

Karst Features Identified in Data Review and Field Surveys

State/County	Approximate Mileposts [a]	Crossing Length (miles)	Length Surveyed (miles)	Percent Surveyed	Data Review		Field Surveys		Comments
					cCDs [b]	sCDs [c]	Point Features [d]	Area Features [e]	
West Virginia									
Randolph County	59.2 – 66.7	7.5	6.5	87	26	3	29	9	Two of the cCDs were associated with abandoned strip mines, not karst. Literature review identified 10 cave entrances within the Karst Review Area but they are neither within nor downgradient of the 300-foot-wide corridor.
Pocahontas County	66.7 – 83.9	17.2	14.6	85 [f]	91	0	61	26	One of the cCDs was a depression associated with a stream meander, not karst. Literature review identified 18 cave entrances in the vicinity, all outside of the 300-foot-wide corridor except Tapp's Trap, which could not be located by the field crew. None of the cave entrances are downgradient of the 300-foot-wide corridor.
Virginia									
Highland County	83.9 – 91.6	7.7	7.4	96 [f]	53	0	18	38	Literature review identified four cave entrances in the vicinity. Most of the features identified in the field, including two cave entrances, are in the Valley Center area.
Bath County	91.6 – 106.8	15.2	4.4	29	44	7	43	1	Literature review identified two small caves on east flank of Tower Mountain (could not be verified due to access restrictions). Most of the field identified features are located along the western pediment of Walker Mountain in the Mill Creek Valley.
Augusta	106.8 – 158.2	51.4 [g]	31.6 [g]	61 [g]	51	44	85	26	Additionally, analysis of LiDAR data indicated the presence of 20 small suspected sinkholes. Data received from VSS indicated that Cochran's Caves No.2 and No.3 are located within the Karst Review Area. Two areas have notable concentrations of karst features: 1) Cochran Cave area southwest of Staunton, VA, and 2) southeast of Stuart's Draft, extending southward towards Sherando Camp.
Total	--	99.0	64.5	65	265	54	236	100	

a All locations are along the AP-1 mainline.

b 300-foot cCDs: Any closed depression that occurred within, touched or received drainage from a 300-foot-wide corridor centered on the proposed pipeline centerline as identified in the data review.

c sCDs: any closed depression occurring with the 0.25-mile-wide Karst Review Area.

d Represents sinkholes, caves, or springs identified in the field surveys.

e Except for one cave in Highland County, Virginia, these area features represent sinkholes identified in the field surveys.

f 100 percent of the area mapped or inferred as karst terrain in the county was surveyed.

g Only 33.8 miles of the crossing was mapped or inferred as karst—93 percent of this length was surveyed.

Source: GeoConcepts (2017)

TABLE 4.1.2-3

Risk Rank Summary of Karst Features Identified in Field Surveys

State/County/Risk Rank [a]		Area Features: Caves	Area Features: Sinkholes	Point Features: Caves	Point Features: Sinkholes	Point Features: Springs	Total
West Virginia							
Randolph County							
Low		0	3	0	7	4	14
Moderate		0	4	0	8	2	14
High		0	2	0	6	2	10
	Subtotal	0	9	0	21	8	38
Pocahontas County							
Low		0	6	0	11	6	23
Moderate		0	7	0	17	2	26
High		0	13	0	23	2	38
	Subtotal	0	26	0	51	10	87
Virginia							
Highland County							
Low		0	3	0	3	0	6
Moderate		0	16	0	5	0	21
High		1	18	1	9	0	29
	Subtotal	1	37	1	17	0	56
Bath County							
Low		0	0	0	3	1	4
Moderate		0	1	0	16	1	18
High		0	0	1	19	2	22
	Subtotal	0	1	1	38	4	44
Augusta County							
Low		0	5	0	31	6	42
Moderate		0	9	0	28	1	39
High		0	12	2	17	0	31
	Subtotal	0	26	2	66	8	102
Total		1	99	4	203	29	336

[a] Data Analysis. Each karst feature identified in the field was evaluated with respect to the following ranking criteria:

I. located on or immediately adjacent to the proposed trench;
II. presence of an open conduit leading into the subsurface;
III. drainage characteristics (i.e., the presence of clear-cut drainage leading into the structure); and
IV. evidence of active soil raveling, tension cracks, or collapse.

High Risk is indicated by the presence of at least two of the ranking criteria, Moderate Risk by the presence of one, and Low Risk by the absence of all.

Source: GeoConcepts (2017)

Pocahontas County, West Virginia (Allegheny Front and Appalachian Plateau). Of the 91 cCD features that were identified in the data review, one was determined to be a depression associated with a stream meander and not karst (GeoConcepts, 2017). GeoConcepts' (2017) literature review also identified 18 cave entrances of which were located outside of the 300-foot-wide corridor except for Tapp's Trap, which was not able to be located by the field survey crew. Field surveys were completed on approximately 100 percent of the proposed alignment in Pocahontas County that is mapped or inferred as karst terrain. The field survey identified 61 point features and 26 area features that are located within, adjoin, or receive drainage from the 300-foot-wide corridor, all of which are sinkholes except for 2 springs. Twenty-five of the features were ranked as high risk, 19 of the features were ranked as moderate risk, and 17 were ranked as low risk karst features.

In addition to the area where ACP crosses the Randolph/Pocahontas border as discussed above, Jones (1997) indicates the presence of subterranean streams as indicated by tracer tests near Clover Lick Valley in Pocahontas County near AP-1 MPs 73 and 74. Here the proposed route crosses above conduits that carry water entering at Clover Lick Creek Upper Sink, Canis Majoris Cave, and Walt Allen Cave, and divert it in a northerly direction under several surface valleys to springs north of ACP where it discharges.

Highland County, Virginia (Folded Appalachians). GeoConcepts (2017) identified 53 cCDs in the data review. Additionally, data provided by the VSS indicated four cave entrances in the vicinity, two of which were subsequently verified and located in the field. Although field surveys were conducted on 96 percent of the proposed route within Highland County, it covered 100 percent of crossing area that was mapped or inferred as potential karst. The field survey identified 18 point features and 38 area features, which were all identified as sinkholes except for two cave entrances. Of the 18 point features that were identified in the survey, 10 were ranked as having high risk, 5 were identified as having moderate risk, and 3 were identified as having a low risk. Most of the features (including the caves) are clustered near Valley Center, which has been cited by commenters as an area of concern. Based on comments received on the draft EIS and review of the 2017 Karst Survey Report (GeoConcepts, 2017), a route variation (Valley Center Route Variation) between AP-1 MPs 88.2 and 89.7 was identified to avoid the karst features east of Valley Center Road (AP-1 MP 88.5) (see section 3.4.3). In addition, commenters expressed concerns about ACP traversing the Dever Spring Recharge Area (approximate AP-1 MPs 87.6 to 89.4). The spring is located approximately 1,500 feet from the project workspace. Field surveys have not yet been completed at this location because access permissions have been denied by landowners. The Valley Center Route Variation appears to reduce the impacts on the Dever Spring Recharge Area and avoid crossing known dye trace vectors (Virginia Cave Board, 2017) between upgradient sources and Dever Spring; however, as discussed in section 3.4.3, we conclude that the Valley Center Route Variation would not offer a significant advantage over the proposed route and, therefore, do not recommend that it be incorporated as part of the project. Atlantic would complete the field survey for karst features in the area pending land access and prior to construction.

Bath County, Virginia (Folded Appalachians). GeoConcepts (2017) identified 44 cCDs in the data review, and the information obtained from VSS indicated the presence of two small caves on the east flank of Tower Mountain, although survey crews could not verify this because of lack of landowner permission. GeoConcepts (2017) completed survey along miles of the alignment in four discontinuous segments (29 percent of the total alignment in Bath County) because of lack of landowner permission. The field survey identified 43 point features (all sinkholes except for 4 springs and 1 cave) and 1 area feature, the majority of which were found along the western pediment of Walker Mountain in the Mill Creek Valley. Of these, 22 were ranked as high risk, 17 were ranked as moderate risk, and 4 were ranked as low risk.

Areas of concern along the ACP alignment in Bath County include: Little Valley (approximate AP-1 MP 93); Burnsville Cove (approximate AP-1 MPs 94 to 96), which includes Jewel Cave (approximate AP-1 MP 96.7), less than 300 feet from the ACP centerline; Brown's Pond Special Biological Area; Cave Ridge; Poplar Hollow Karst (approximate AP-1 MPs 96 to 98); and Windy Cove Cave Conservation Site between approximate AP-1 MPs 99 and 102.5. Recently available LiDAR data indicate that several surface karst features (sinkholes) are present around Little Valley. However, because Atlantic has not received permission from landowners for field surveys, final locations of the surface karst features in the area would be determined when access permissions have been obtained. Dye trace tests (Davis, 2015) conducted in the area determined that water from sinking streams flowing into subsurface conduits can travel miles over a couple days, further indicating the degree of subterranean karst development.

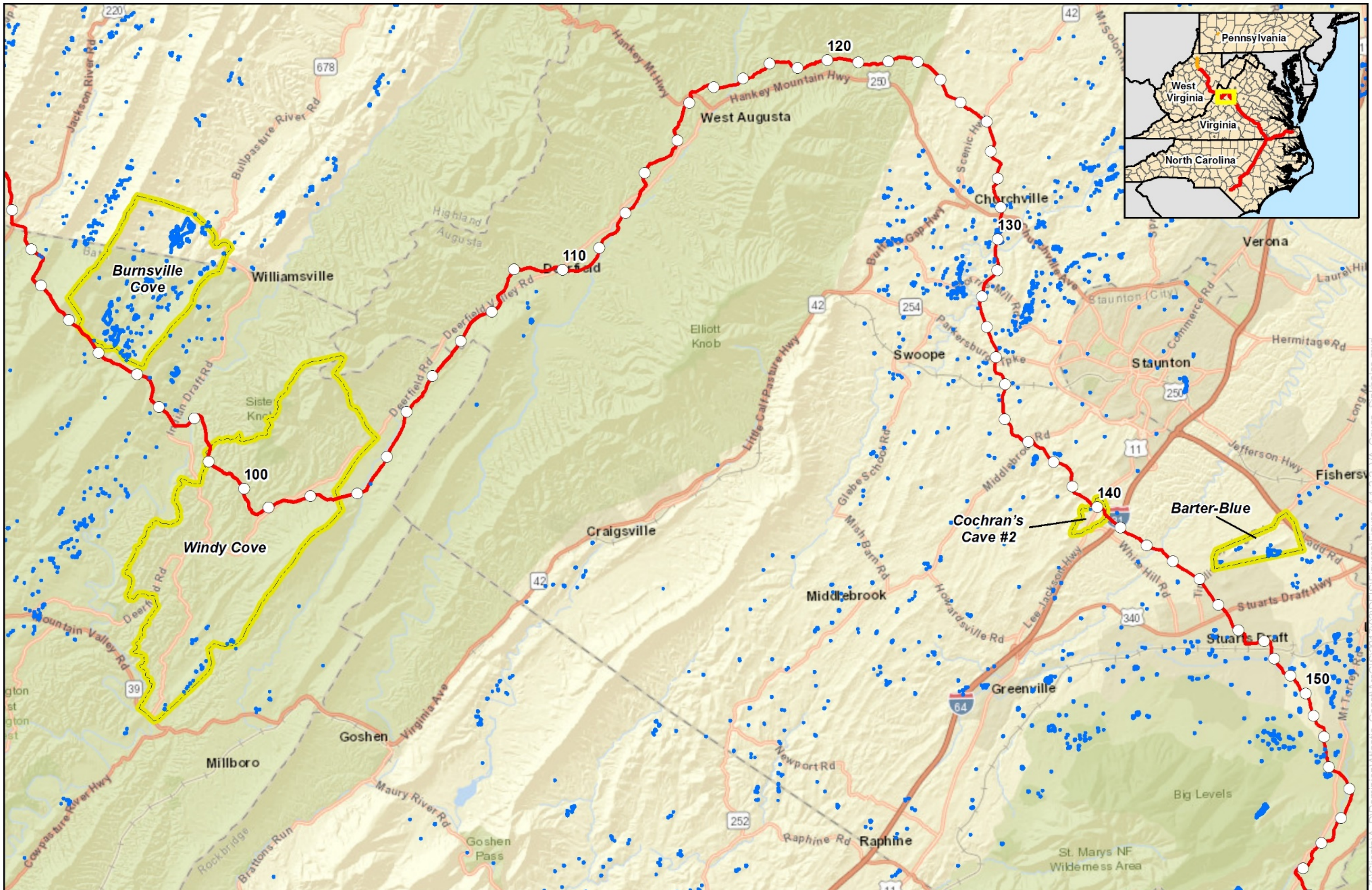
Figure 4.1.2-2 illustrates the locations of Cave Conservation Sites as designated by the VDCR as well as sinkhole locations identified by the VDMME. The VDCR stated that the Windy Cove Conservation Site is unlikely to be impacted by ACP unless the proposed alignment is moved significantly to the south. The Burnsville Cove Cave Conservation Site has a biodiversity significance ranking of B1, indicating that it is of first order global significance in terms of biodiversity conservation. The Virginia Cave Board commented that the ACP route would cross the Burnsville Cove Cave Conservation Site. Current GIS coverage received from the VDCR indicates that the proposed construction workspace is within 0.5 mile of the conservation site for over 2.0 miles. However, further consultation with the VDCR determined that the proposed ACP workspaces are located to the south of the conservation site, and proposed trenching activities would not pass over or intercept any known cave systems in the Burnsville Cove Cave Conservation Site. In addition, several, but not all, access roads which would have passed through the conservation site have since been rerouted outside of the Burnsville Cave Conservation Site. Comments were received that noted the boundary of the Burnsville Cove Cave Conservation Site was developed using pre-existing data, but this boundary may not be an accurate reflection of the complete watershed boundary. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should consult with the VDCR to determine if the route alignment and construction activities would impact the Burnsville Cove Cave Conservation Site. Atlantic should file with the Secretary, for review and written approval by the Director of OEP, the results of these consultations, along with any proposed construction modifications or alignment shifts to avoid impacts on this site.**

Augusta County, Virginia (Great Valley). GeoConcepts (2017) identified 51 cCDs in its data review and 20 small sinkholes from analysis of LiDAR data. Additionally, data from VSS indicated that Cochran's Caves No. 2 and 3 are located within the KRA and about 400 feet north and 700 feet south of the proposed AP-1 route. ACP route would cross 51.4 miles in Augusta County. Only 33.8 miles was determined to have potential for karst features, and field surveys were conducted over 93 percent of this area. The field surveys identified 85 point features and 26 area features as sinkholes except for 2 springs and 2 caves. Of the 85 karst features identified in the surveys, 19 were ranked as high risk, 29 were ranked as moderate risk, and 37 were ranked as low risk. Additionally, the surveys identified two notable areas of concentrations of karst development: the Cochran Cave area southwest of Staunton, and an area southeast of Stuart's Draft that extends southward towards Sherando Camp. Areas of concern include the crossing of karst near Deerfield (approximate AP-1 MP 109), and two areas with a heavy concentration of sinkholes near Churchville (approximate AP-1 MPs 127 to 141) and Stuarts Draft (approximate AP-1 MPs 145 to 153). The area near AP-1 MP 109 does not appear to be included in the latest Karst Survey Report (GeoConcepts, 2017). Therefore, to ensure that this karst area is reviewed and impacts minimized or avoided, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should conduct a data review and field survey of potential karst features in Augusta County, Virginia between AP-1 MPs 106.8 and 110, and file this information with the Secretary, along with any mitigation measures, for review and written approval by the Director of OEP.**

The proposed route traverses the Cochran's Cave Conservation Site near Staunton at approximate AP-1 MP 140, and passes within approximately 0.5 mile of the Barter-Blue Cave Conservation Site at AP-1 MP 144 (see figure 4.1.2-2). No impacts to the Barter-Blue Cave Conservation Site are anticipated. Cochran's Cave Conservation Site is designated as a fourth order globally significant conservation site, and the Virginia Cave Board states that Cochran's Cave No. 2 is the only significant cave designated under the Virginia Cave Protection Act of 1979 that would be crossed by the ACP route. The cave is known to harbor sensitive species such as Virginia big-eared bats, Indiana bats, and Northern long-eared bats, and it is thought the upwelling underground spring is ideal habitat for the Madison Cave isopod; however, this species has not been documented in Cochran's Cave. Ceiling heights of 70 feet have been reported in the cave, increasing the likelihood that the cave passage could be impacted by construction activities.



For Environmental Review Purposes Only

Figure 4.1.2-2
Virginia Caves and Sinkholes
Atlantic Coast Pipeline and Supply Header Project

- Milepost
- ACP Proposed Route
- VaDMME Sinkhole
- Virginia Cave Conservation Site

Source: Z:\Clients\A_D\Dominion\Atlantic_Coast\ArcGIS\2017\03\DEIS\Figures\Figure_4.1.2-2_VA_Caves_Sinkholes.mxd
Date: (5/10/2017)

GeoConcepts completed a subsurface ERI, hydrologic, and dye trace investigation of the Cochran's Cave Conservation Site in fall 2016 and filed the report with FERC in January 2017.[3] The ERI and air track boring results showed three air-filled voids at a depth of greater than 20 feet below grade that would not be expected in impact the pipeline excavation. The hydrologic investigation results showed that Moffett Lake appears to be supplied by the Cave Spring and by an additional source. The dye trace investigation confirmed a hydraulic connection between the stream in Cochran's Cave No. 2 and the stream emerging from the spring cavern. While the VDCR would prefer that Atlantic avoid crossing the conservation site, it recognizes that there are factors that may make avoidance impossible. The VDCR concludes that based on the studies completed on Atlantic's behalf, the route adjustments made, and Atlantic's commitments to use onsite karst specialists to monitor construction, the potential impacts on the cave have been mitigated to the maximum extent practicable (VDCR, 2017e).

Construction Impacts and Mitigation

Because subsurface karst features, such as caves and sinkholes, can exist without exhibiting any form of surface expression, Atlantic would perform an ERI investigation survey to detect subsurface solution features along all portions of the route that are mapped as limestone bedrock at the surface prior to construction, as described in the *Karst Mitigation Plan*. To ensure the analysis reflects field conditions, the resistivity results would be correlated with boring logs for equivalent sections within a locality. Further, an Atlantic karst specialist would inspect the right-of-way and document any suspected karst features prior to construction.

During construction, Atlantic would employ a karst specialist to monitor the karst features identified along the right-of-way. Features located within the area of earth-disturbing activities would be assessed for preconstruction remediation. Features lying within the right-of-way but not intercepted by the excavation would be monitored for changes, such as soil subsidence, rock collapse, sedimentation, increased surface water infiltration, flooding, and clogging. Additionally, the karst specialist would monitor for karst features that may be intercepted or form during construction, and make an assessment regarding its potential impact and whether mitigation measures would be required. Atlantic and DETI would inform the FERC and the VDCR of karst-related issues encountered and addressed during construction in their regular construction status reports.

The primary geologic impact that could affect the proposed pipeline and aboveground facilities in karst sensitive areas is the sudden development of a sinkhole that damages the facilities and poses a safety risk. Other subsidence features could develop gradually over time, but would not pose an immediate risk to the proposed facilities. As discussed below, the development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging project-related water into otherwise stable karst features.

Atlantic and DETI developed the *Karst Mitigation Plan* to address karst features encountered during construction and further reduce the potential to initiate sinkhole development during construction and operation of the facilities. Remediation of such features would comply with the NRCS's Conservation Practice Standard Code 527 Karst Sinkhole Treatment (NRCS, 2010), and the WVDEP's Ground Water Protection Program Sinkhole Mitigation Guidance (WVDEP, 2005). Measures identified in the *Karst Mitigation Plan* that are designed to prevent or minimize impact include:

- conducting a preconstruction geophysical survey to obtain more information on subsurface conditions;

[3] Accession Number: 20170127-5202

- training geology and engineering staff on the identification and mitigation of karst features;

- deploying a karst specialist during construction activities to confirm, monitor, and assist in limiting potential negative impacts on existing karst features;

- conducting a preconstruction inspection of the right-of-way to confirm, identify, and assess surface karst features;

- monitoring features identified during the preconstruction inspection, features that are intercepted during construction; and features that form during construction;

- characterizing and documenting the following features intercepted during construction: soil subsidence, rock collapse, sediment filling, sinking or losing streams, springs, seeps, flooding, and caves or void space;

- depending on site-specific conditions, implementing a minor reroute of the pipeline or installing thicker-walled pipe;

- karst point features, as well as a 300-foot buffer around each, would be clearly marked in the field with signs and/or highly visible flagging in all work areas (within and off the right-of-way, including discharge areas) until construction related ground disturbing activities are completed;

- if a subsurface void opens or is intersected, or a new sinkhole forms within the construction work area, work in that area would stop and the void would be isolated from the rest of the work area. If karst features are encountered during construction that require stabilization or mitigation, Atlantic would consult with and incorporate recommendations from the appropriate federal and state agency (VDCR, Karst Protection in Virginia; and the WVDEP) to ensure pipeline integrity and protection of the aquatic resource and subterranean habitat. Atlantic would contact the FWS Virginia Field Office immediately, and have an on-call Biological Monitor to investigate the exposure of any previously unidentified voids or conduits that occur within the Madison Cave isopod priority area. These procedures would generally involve backfilling of the feature with sand, gravel, rock, or grout, or combinations thereof, with the overarching goal of preventing further collapse and raveling of surface material while maintaining infiltration of recharge waters to the aquifer as detailed in the *Karst Mitigation Plan*;

- implementing surface water and erosion control measures, including diversion, detention, or collection and transportation, to prevent construction-influenced surface water from free flowing into karst features;

- preventing the disposal of materials into karst features that could harm water quality;

- placing excavated spoil on the up-slope side of the excavation near karst features;

- maintaining minimum of 25 feet of natural vegetated buffer area around a waterbody or karst feature where possible;

- implementing a *Spill Control, Control, and Countermeasures Plan* (*SPCC Plan*), including flagged buffers for re-fueling and parking near karst features;

- if required, conducting blasting in a manner that would not compromise the structural integrity or alter the karst hydrology of known or inferred subsurface karst structures. If one or more voids totaling 6 inches or more in depth is encountered during drilling for explosive emplacement, blasting would not be used, or subsurface exploration would be conducted to evaluate the connectivity to deeper structures. Only low-force charges, designed to transfer the explosive force only to the rock to be removed, would be used. The excavation would be carefully inspected for any voids, openings, or other signs of karst. If excavation has intercepted an open void, channel, or cave, work would cease until a remedial assessment can be carried out by a qualified geologist or engineer with experience in karst terrain and in consultation with the appropriate federal and state agencies;

- avoiding the discharge of hydrostatic test water or other project related water in karst areas, if possible. If discharge of water is unavoidable, water should be discharged into uplands as far as possible from flagged or marked buffer areas of karst features, and additional sediment and water flow control dissipating devices would be used to minimize impacts; and

- pending landowner authorization, preventing unauthorized access to cave entrances and open-throat sinkholes by blocking the appropriate access roads and rights-of-way with gates or other structures.

The VDCR specifically requested that Atlantic contact, consult, and coordinate with the VDCR's Karst Protection Coordinator if geotechnical borings are required in karst terrain, and if karst features are encountered in Virginia to document and minimize adverse impacts from ACP. They further request that Atlantic provide detailed location information and design specifications for any proposed "improvement" of sinkholes or cave openings. Additionally, they recommend that ACP follows the Virginia Cave Board's "Karst Assessment Standard Practice" for land development (Virginia Cave Board, 2015). To ensure geotechnical boring do not result in adverse effects and that mitigation protocols adequately satisfy VDCR's standards, **we recommend that:**

- **<u>Prior to completing any geotechnical boring in karst terrain</u>, Atlantic should file with the Secretary verification that it consulted with VDCR karst protection personnel regarding each geotechnical boring and should follow the Virginia Cave Board's "Karst Assessment Standard Practice" for land development when completing the borings.**

Construction issues associated with karst would be noted in the EIs' daily reports and would include karst features encountered and mitigation measures taken. The monthly construction status report would include a summary of these activities.

We received a comment, which included a study that expressed concern that pipeline construction could "behead" karst conduits supplying water to springs. We reviewed the study, and did not find the supporting data that would lead to this potential conclusion. Atlantic's karst consultant concluded that beheading of underground feeder streams is unlikely to occur because the typical trench excavation depth is 10 to 12 feet, which is not likely to intercept underground conduits. We concur with that conclusion.

Operation Impacts and Mitigation

To evaluate the impact that sinkholes may have on the operation of ACP, we reviewed DOT, PHMSA data on significant pipeline incidents from 1995 to 2014 for Virginia and West Virginia (PHMSA, 2015a). A significant incident is defined as meeting one of the following criteria:

- fatality or injury requiring in-patient hospitalization;
- $50,000 or more in total costs, measured in 1984 dollars;
- the release of at least 5 barrels of highly volatile liquid or 50 barrels of other liquids; and
- liquid releases resulting in an unintentional fire or explosion.

The PHMSA data include reports of damage to pipeline facilities due to unspecified earth movements. A sinkhole event is considered an earth movement by PHMSA, but it is not known whether any of the incidents caused by earth movement were the result of sinkholes.

A total of 58 significant incidents were reported in Virginia and 33 significant incidents were reported in West Virginia from 1995 to 2014 (PHMSA, 2015a). Of the 52 incidents in Virginia, only 3 were attributable to earth movement. These incidents occurred in Norfolk and Hanover Counties and in Richmond, far from the karst areas crossed by ACP. Of the 33 incidents in West Virginia, 2 were attributable to earth movement in Putnam and Harrison Counties, and 1 to heavy rains and floods in Wetzel County. Again, none of these were close to the karst areas traversed by ACP. We note that PHMSA regulates about 3,080 miles of natural gas transmission line in Virginia and 3,860 miles of natural gas transmission line in West Virginia (PHMSA, 2015b). In addition, Virginia and West Virginia have about 40,100 miles and 13,150 miles of natural gas distribution pipeline, respectively. Many miles of these pipeline facilities have operated for decades in karst sensitive areas in both states without reported earth movement incidents.

In the Appalachian Mountains of West Virginia and Virginia, existing pipelines that cross karst terrain include the Columbia and East Tennessee natural gas pipeline systems. Of the 27 Virginia counties that contain karst features, 20 of them (74 percent) appear to have at least 1 existing natural gas transmission pipeline that traverses the county and is likely located on karst. Virginia law (the Virginia Cave Protection Act, Code of Virginia Section 10.1-1000 to 1008) protects caves and cave communities from disturbance, vandalism, and pollution; however, there is no corresponding state law that addresses or restricts construction within karst terrain (Virginia Cave Board, 2017). Also, DOT regulations do not specifically address pipeline design, construction, and/or operation in karst terrain.

The pipeline and aboveground facilities would be designed, constructed, monitored, and maintained in accordance with DOT regulations and industry standards that are protective of public safety (see section 4.12). Atlantic and DETI conservatively determined that the proposed 42-inch-diameter pipeline would be able to span 40 feet unsupported without any sign of deflection or sag. This span strength would further reduce the potential for a serious pipeline incident should karst degradation cause a void beneath the pipeline.

All karst features that form during construction within the right-of-way, whether remediated or left in an undisturbed natural state, would be monitored by the Atlantic/DETI karst specialist for any changes in appearance, drainage, siltation, etc., at 1, 2, and 5 years following construction, and at 5-year intervals thereafter. If any changes are observed, the karst specialist would provide consultation on potential impacts and recommend mitigative measures, if and as necessary. Due to a significant number of public comments regarding pipeline integrity and safety in areas of potential karst collapse and subsidence, and because monitoring is a key element to providing safe operation of the pipeline over its lifetime, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a revised *Karst Terrain Assessment Construction, Monitoring, and Mitigation Plan* that includes monitoring of all potential karst areas for subsidence and collapse using LiDAR monitoring methods during years 1, 2, and 5 following construction.**

Because methane is lighter than air, it would generally dissipate rapidly in the event of a pipeline leak, thereby causing little to no impact on karst or groundwater resources. However, concern was raised regarding the potential impacts of natural gas being drawn into a cave due to barometric changes, and methane dissolution into groundwater in the event of a leak. Because the pipeline would be installed either in soil or weathered bedrock, it is highly unlikely that any methane gas would be drawn into cave systems due to changes in atmospheric pressure. Moreover, the *Karst Mitigation Plan* specifically requires inspection of the trench during construction for any openings into the subsurface, and if openings are found, they would be sealed and/or mitigated to prevent migration and transport of contaminants, including gas-phase hydrocarbons. Methane has a solubility limit of 3.5 ml/100 ml of H_2O at 17 degrees Celsius, and is highly evaporative and readily degasses from aqueous solution and is considered non-toxic when dissolved in water. If methane was to partition into the groundwater, the impacts would be local and temporary. However, concentrations of methane in water exceeding 10 mg/L may have explosive potential if the methane degasses and migrates into enclosed spaces such as water well casings. Given that the pipeline would be monitored during operation and the likelihood of a gas release is low, we conclude that the probability for methane to impact karst features and associated groundwater to be low.

4.1.3 Mineral Resources

Non-fuel mineral resources identified in states and commonwealths crossed by ACP and SHP include crushed stone, sand and gravel, cement, lime, zirconium (Virginia only), phosphate rock (North Carolina only), and feldspar (North Carolina only) (USGS, 2013a).

The Appalachian region has a long history of coal production and numerous commercial coal mining operations (surface and underground) have operated since the late 1700s (Pennsylvania Department of Environmental Protection [PADEP], 2015a). Approximately 216 million tons of coal were mined in 2011 in Pennsylvania, Virginia, and West Virginia. No coal mining occurs in North Carolina (USGS, 2013a). Underground coal mines crossed by ACP and SHP would be room-and-pillar mines, where mine structural integrity is maintained by leaving pillars of the coal resource and timbers to provide mine ceiling (or roof) support, or longwall mines where a hydraulic roof support system is used during coal extraction and removed as the coal bed is removed. The roof rock is left unsupported as the hydraulic support system is removed, allowing the roof to collapse and potentially causing subsidence of the overlying ground surface. ACP pipelines would cross 15 known underground coal mines and SHP pipelines would cross 1 known underground coal mine. Additional discussion of potential impacts associated with mine subsidence is provided in section 4.1.4.5.

Oil and gas has been produced from conventional and unconventional reservoirs in Pennsylvania, West Virginia, and Virginia. Conventional production typically involves drilling vertical wells into sandstone and limestone reservoirs, whereas unconventional production involves drilling horizontally into shale deposits and hydraulically fracturing the shale to stimulate production. Conventional drilling for oil and natural gas resources has occurred in the ACP and SHP region since 1859. Over the last 5 years, the use of horizontal drilling and hydraulic fracturing have resulted in oil and gas production from the Marcellus Shale and Utica Shale in Pennsylvania and West Virginia.

A total of 304 and 166 active and inactive oil and gas wells have been identified within 0.25 mile of ACP and SHP, respectively (WVDEP, 2014a), along with gathering lines and other production facilities. Of these, a total of 14 active and 4 inactive or abandoned oil and gas wells occur within the ACP workspace. In addition, nine reclaimed surface mines would be crossed by the AP-1 mainline, in Lewis, Upshur, and Randolph Counties, West Virginia. No oil and gas wells occur within SHP workspace. Atlantic would consult with the well owners to revise construction workspace to avoid the well, or route around the well by an agreed-upon buffering distance. Comments were received concerning unknown orphan oil and gas wells that are not identified in state databases and could be encountered during construction. All oil and gas wells that were observed during project civil survey efforts were surveyed and incorporated into project alignment sheets. If a previously unidentified well is found during construction, Atlantic and DETI would follow a process similar to encountering a previously unknown utility line. The well would be identified, mapped, flagged, and avoided by the pipeline trenchline. If removal of the well is determined to be necessary, Atlantic or DETI would consult the owner and appropriate regulatory agencies as needed. Construction of ACP would require shallow excavation, and as a result, no impact would occur on the relatively deep oil and gas resources or the associated wells. As such, we conclude that ACP and SHP would not significantly impact active and inactive oil and gas wells in the project area.

Three active mineral resource facilities were identified within 0.25 mile of ACP. No active mining operations have been identified within 0.25 mile of SHP, and no active mineral resource facilities are crossed by ACP or SHP. Comments were received concerning inactive or proposed coal mines that may be crossed by ACP. Atlantic has identified 26 coal mines that are crossed by ACP in West Virginia where the mine status is identified as abandoned, permit revoked, closed-released, or not started. Atlantic has also identified 15 non-fuel mineral mines (manganese, limestone, clay, shale, and sand and gravel) that are within 0.25 mile of ACP. Atlantic is coordinating with these mine owners and/or operators to minimize and/or avoid impacts on these mines. Based on the above, we conclude that ACP and SHP would not significantly impact mineral resource operations in proximity to the projects.

4.1.4 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Potential geologic hazards in ACP and SHP areas include earthquakes, surface faults, soil liquefaction, landslides, flooding; karst, acid-producing rock, and ground subsidence associated with historic underground coal mining.

4.1.4.1 Seismic Related Hazards

Most significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (e.g., California), or where tectonic plates are converging (e.g., the Indian Sub-continent). Unlike these highly active tectonic regions, the east coast region of the United States occurs on the trailing edge of the North American tectonic plate, which is relatively quiet. While the east coast of the United States is relatively seismically quiet, earthquakes do occur in ACP and SHP areas, largely due to trailing edge tectonics and residual stress released from past orogenic events.

The shaking during an earthquake can be expressed in terms of the acceleration due to gravity (g). Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake, expressed in terms of g. For reference, peak ground acceleration (PGA) of 10 percent of gravity (0.1 g) is generally considered the minimum threshold for damage to older structures or structures not constructed to resist earthquakes (Federal Emergency Management Agency [FEMA], 2006). The American Society of Civil Engineers Technical Council on Lifeline Earthquake Engineering defines the 10 percent probability of exceedance in 50 years (475-year return period) as the contingency design earthquake for pipelines. The 2006 International Building Code has adopted the 2 percent probability of exceedance in 50 years (2,475-year return period) for the design of buildings (International Code Council, 2006).

The USGS (Petersen et al., 2016) estimates there is a 2 percent chance for an earthquake to occur over the next 50 years (recurrence interval of 2,475 years) that would result in a PGA greater than 0.1 gravity (g) for two locations within ACP and SHP areas. The area within the AP-1 mainline between MPs 170 to 260 is an area where PGA between 0.10 g and 0.15 g may be attained due to the proximity of the Central Virginia Seismic Zone (CVSZ)[4] located approximately 25 miles to the northeast. The area near the terminus of the AP-2 mainline near Charleston, North Carolina is an area where PGA between 0.10 g and 0.11 g may be attained (Petersen et al. 2015). In such an event, the perceived shaking would be strong, but the potential damage would be light. The USGS also estimates that there is a 10 percent chance for an earthquake to occur in the next 50 years (i.e., a recurrence interval of 475 years) that would result in a PGA of between 0.02 g and 0.04 g in the project area. The remainder of ACP and SHP would be in areas with lower seismic risk than the areas noted above.

Earthquakes can also cause damage by causing the ground surface to break along a fault line. For a fault to be considered active, displacement must have taken place in the last 10,000 years (USGS, 2008). There is no evidence that the alignment crosses any active faults exhibiting surficial ground rupture. Sub-surface or blind faults present less potential for displacement of bedrock during earthquakes than surface faults. The USGS has completed several studies to identify Quaternary (less than 1.6 million years old) faults and other tectonic structures in the eastern United States (Crone and Wheeler, 2000; Wheeler, 2005), resulting in a database of Quaternary faults, liquefaction features, and other tectonic potential tectonic features (Quaternary Fault and Fold Database) (USGS, 2006). These features are evaluated and classified into one of four categories (Class A, B, C, or D). Class A features have geologic evidence that demonstrates the existence of a Quaternary fault or tectonic origin either exposed by mapping or inferred deformational features. Class B features have geologic evidence that is indicative of a Quaternary deformation, but the fault is not deep enough to be a potential source for earthquakes or the evidence available is too significant to assign a fault as Class B, but not enough to assign as Class A. Class C features do not have sufficient evidence to demonstrate the existence of a tectonic fault, or Quaternary slip or deformation associated with the feature. Class D features are defined by the USGS as not to be seismogenic (Crone and Wheeler, 2000).

The CVSZ is a Class A feature located within the Appalachian Piedmont Province, and at its closest point as defined by the USGS, is located approximately 25 miles to the northeast of ACP at AP-1 MP 210. The CVSZ is associated with the Spotsylvania high-strain zone, which is a boundary of weakness between two bedrock terranes (Chopawamsic and Goochland), and the location of the August 23, 2011 earthquake event that occurred in Mineral, Virginia. The CVSZ has the potential for future earthquakes that relieve stresses that buildup within the bedrock of central Virginia as the North American Tectonic Plate moves westward. The proximity of ACP to the CVSZ increases the potential for a significant seismic event in the project area, which is reflected in the USGS PGAs discussed above (Crone and Wheeler, 2000).

ACP and SHP do not cross any identified faults that exhibit evidence of activity within the last 1.6 million years. The proposed ACP is within 100 miles of nine faults identified in the USGS Quaternary Fault and Fold Database; three Class C faults would be crossed by the project at ACP segment AP-1 MP 186, near the intersection of segments AP-1, AP-2, and AP-3, and at ACP segment AP-2 MP 150. SHP would not intersect any known, mapped, or interred active fault lines (USGS, 2006).

We received comments regarding the August 23, 2011 magnitude (M) 5.8 earthquake (MMI VII to VIII) near Mineral, Virginia and the associated Quail Fault as a concern. The Mineral earthquake occurred

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[4] The Central Virginia Seismic Zone include various terranes that were accreted onto the edge of the North American tectonic plate in the Paleozoic era.

within the CVSZ and the epicenter is located approximately 50 miles northeast of ACP from AP-1 MP 210 at a depth of approximately 4.3 miles. This earthquake caused substantial damage to buildings and monuments located within 100 miles of the epicenter, concentrated from central Virginia to Washington D.C. (Horton et al., 2015a). A new buried fault with no surface expression, named the Quail Fault, has been proposed as the source of the August 23, 2011 earthquake (Horton et al., 2015b). This earthquake did not cause natural gas pipeline failures (Green et al., 2015); however, news reports from the day indicate possible local gas service line leaks after the earthquake (Thomas and Turkle, 2013).

We received comments regarding potential impacts on the projects from the Staunton-Pulaski fault and Harriston fault. The Staunton-Pulaski fault is an inactive Valley and Ridge thrust fault that was active during the Paleozoic Era (Bailey, 2000). The Harriston fault has a topographic expression in pre-Pleistocene alluvium and colluvium; however, it has not been determined whether the topographic expression (surface trace) is due to Pleistocene or younger tectonic activity or a result of subsidence caused by groundwater dissolution of underlying carbonate bedrock along the fault (Wieczorek et al., 2004). As such, we conclude ACP and SHP would not be affected by the Staunton-Pulaski and Harriston faults.

Soil liquefaction is a phenomenon that occurs when granular, saturated soil temporarily loses strength when subject to strong and prolonged shaking as may occur during an earthquake. Structures located on or within an area experiencing soil liquefaction could sustain damage due to loss of underlying soil strength. The potential for soil liquefaction to occur in the ACP area is low; however, two small soil liquefaction sites were located within 5 miles of the epicenter of the 2011 Mineral earthquake within the CVSZ (Green et al., 2015). The low number of observed liquefaction features is likely due to regional soils relatively low liquefaction susceptibility (Green, 2012) and suggests that an earthquake in excess of M 7.0 has not occurred in the CVSZ in the last 5,000 years (Obermeier and McNulty, 1998). The potential for soil liquefaction to occur in SHP area is low based on the low seismicity of the region, and no occurrences of soil liquefaction have been documented in SHP area.

In conclusion, ACP and SHP are sited in areas with low probability of localized earth movement. However, the AP-1 mainline would traverse an area of the CVSZ, between MPs 170 and 260 with peak ground accelerations approach 0.15 g, and given the recent (2011) Mineral earthquake, there is a potential for an M 5.8 earthquake (MMI VII to VIII). ACP and SHP pipelines would be capable of withstanding seismic events of this magnitude and greater. Project facilities would be constructed to meet federal standards outlined in 49 CFR Part 192, ASME B31.8-2014 Paragraph 840, and "Guidelines for the Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines (Pipeline Research Council International, 2004), further reducing the potential for seismic-related damage to occur. These are the same regulations that govern the construction and operation of natural gas pipelines throughout the country, including areas with greater seismic hazards.

Further, maintained pipelines constructed using modern, arc-welding techniques have shown to resist moderate amounts of movement without damage (O'Rourke and Palmer, 1996). A review of natural gas transmission line performance after a 1994 seismic event in California showed that 91 percent of all pipeline damaged occurred in areas with earthquakes greater than or equal to MMI VIII (O'Rourke and Palmer, 1994). As such, the risk of a significant earthquake in the project area damaging the pipeline is low; the risk of seismic ground faulting to occur is also low; and the risk of pipeline damage due to soil liquefaction is considered low.

4.1.4.2 Slope Stability

The field reconnaissance conducted during Phase 1 and Phase 2 of the Geohazard Analysis Program consisted of aerial and ground reconnaissance. The purpose of the aerial reconnaissance was to collect photographic evidence of potential slope instability features and steep slopes, as well as a perspective of geomorphic, geologic, and geotechnical conditions. The Phase 1 ground reconnaissance activities were conducted to become familiar with the various types of geohazards that were present across ACP and SHP, to observe any geomorphic evidence of hazards at the sites that was not identified during desktop analysis, and to calibrate the proposed ranking of threat levels. The Phase 2 ground reconnaissance activities consisted of identification of scarps and erosional features associated with past slope instability, characterizing potential slope instability indicators, including, but not limited to, geomorphic expression of surficial movement, such as localized distorted tree growth and saturated ground conditions, and collecting photographic documentation of these indicators.

Two days of aerial reconnaissance and several days of ground reconnaissance were performed during Phase 1 of the Geohazard Analysis Program. Portions of ACP segment AP-1 and SHP segment TL-635 were reviewed by aerial reconnaissance on November 5, 2015 and the remaining portions of ACP segments AP-1, AP-2, AP-3, and AP-4 were reviewed by aerial reconnaissance on November 9, 2015. Ground reconnaissance was performed between November 2 and November 10, 2015, at sites located near ACP segments AP-1, AP-2, AP-3, and SHP segment TL-635. A total of 24 potential geotechnical hazard sites, 19 sites along ACP segment AP-1 and 6 sites along SHP segment TL-635, were observed during Phase 1 ground reconnaissance.

One day of aerial reconnaissance and multiple days of ground reconnaissance were completed during Phase 2 of the Geohazard Analysis Program. Aerial reconnaissance was performed on April 6, 2016, covering approximately 130 miles of AP-1 between MPs 25 and 127, along the GWNF6 reroute where LiDAR imagery was not available at the time. Ground reconnaissance was performed between March 28, 2016 and May 6, 2016, where 55 potential steep slope of slope instability hazard sites identified during Phase 1 desktop analysis were observed. Thirty-eight sites were located along ACP AP-1 segment, between MP 0.0 and MP 172.6, and 17 of the sites were located along SHP TL-635 segment. An additional 30 sites were identified during desktop analysis where ground reconnaissance was recommended; however, they were not visited due to land access restrictions, or due to reroutes where ground reconnaissance could not be completed in time for report deadlines. For all 55 sites visited during Phase 2 ground reconnaissance, new hazard rankings were assigned based upon assessment of field conditions and anticipated construction impacts. Ten sites, five on ACP and five on SHP, have been assigned a high potential slope instability hazard. Sixteen sites, eight on ACP and eight on SHP, have been assigned a moderate potential slope instability hazard. Seventeen sites, 14 on ACP and 3 on SHP, have been assigned a low potential slope instability hazard. Twelve sites on ACP were dismissed as having no potential slope instability based on the results of ground or aerial reconnaissance.

Landslides

A landslide is defined as the movement of a mass of rock, debris, or earth materials down a slope. Landslides can be initiated by heavy rainfall, earthquakes, changes in groundwater conditions (i.e., seasonal high water tables), and/or slope disturbance resulting from construction activity. Information on landslide incidence and susceptibility was provided by a digitally compiled USGS Landslide Overview Map of the Conterminous United States (Radbruch-Hall et al., 1982), as well as an analysis of remote sensing platforms data including aerial photographics and LiDAR imagery, and by conducting field surveys.

Very few steep slopes along ACP and SHP were found to contain landslides. While colluvium accumulation was observed on most of the steep slopes, the colluvium was thin and overlying bedrock. Signs of creep[5] were often observed in the colluvium. Creep in colluvium is not found in conjunction with

[5] Creep is the imperceptibly slow, steady, downward movement of slope-forming soil or rock. Movement is caused by shear stress sufficient to produce permanent deformation, but too small to produce shear failure. USGS Landslide Types and Processes https://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf.

naturally occurring landslides, but it can be an indication that a slope is reaching the point of failure and slope instability could be induced during pipeline construction activities.

Natural landslides may occur during the construction, operation, and maintenance of ACP and SHP. Potential natural landslides in the project area include a variety of mass movements such as debris slides, debris flows, rockslides, rockfalls, and slumps. Debris flows (also referred to as mudslides, mudflows, or debris avalanches) are the dominant type of rapid, catastrophic landslide (Wooten et al., 2015; Eaton et al., 2003; Sas and Eaton, 2008; Morgan et al., 1999; USGS, 1996; Jacobson et al., 1993; Clark, 1987; Hack and Goodlett, 1960). Landslide damage during construction and operation of the project pipeline could lead to additional disturbance of land and environmental resources in order to stabilize the landslide, replace the affected pipeline section, or to reroute sections of the pipeline that cannot be stabilized.

Project-induced landslides, such as failures of cut slopes or fill slopes, may result from the construction, operation, and maintenance of the pipelines and access roads. Project-induced landslides can create risks to public safety, environmental resources, and infrastructure on lands upslope and downslope as well as within the access roads and pipeline corridors. Fill slopes, especially inadequately constructed and maintained fill slopes, are a source of debris flows in mountainous terrain (Collins, 2008; Wooten et al., 2009; Latham et al., 2009; Wooten et al., 2014; Wooten et al., 2015).

Another type of project-induced landslide may result from the projects' alteration of the surface and subsurface drainage in the areas of construction and in adjacent natural slopes along the pipeline and access roads. Changes in surface and subsurface drainage may increase pre-existing landslide hazard potential on natural slopes adjacent to the pipeline and access roads, and may create or contribute to failure of the natural slopes adjacent to the pipeline and access roads.

The stability of cut slopes and fill slopes during the construction period and in the decades of operation and maintenance will depend on many engineering geologic or geotechnical factors, such as slope gradient or inclination; the bedrock structure (orientation and distribution of bedrock fractures or discontinuities); the mass strength properties of in-place bedrock and surficial materials including soils and colluvium; the mass strength properties of excavated bedrock fragments and surficial materials used as fill, as well as fill imported from off-site; the nature of the contact between in-place bedrock and surficial materials including soils and colluvium (transitional or sharp; planarity); the degree to which fill is compacted; the nature of the contact between in-place bedrock and fills (transitional or sharp; planarity); rainfall quantity and intensity; and surface and subsurface drainage including near-surface groundwater and springs.

As discussed in section 4.1.2.3, Atlantic is conducting geotechnical hazards analysis of the projects (Geosyntec Consultants, Inc. [Geosyntec], 2016). This Geohazard Analysis Program identified locations along the proposed route that might be susceptible to landslides. The Geohazard Analysis Program included a desktop analysis including a review of remote sensing platforms such as aerial photographs and LiDAR imagery, aerial reconnaissance, and ground reconnaissance to identify geotechnical hazard locations. These hazards were categorized as low, moderate, or high threat level, with the hazard ranking adjusted as needed based on field reconnaissance.

In West Virginia, 73 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides. In Virginia, approximately 28 percent of the AP-1 mainline route would cross areas with a high incidence of and high susceptibility to landslides (Highland, Bath, Augusta, and Nelson Counties); 21 percent would cross areas with a moderate incidence of and high susceptibility to landslides (Augusta, Nelson, and Buckingham Counties); and 7 percent would cross areas with a moderate incidence of and moderate susceptibility to landslides (Augusta County). The remainder of the AP-1 mainline, as well as the entire AP-2 mainline and the AP-3, AP-4, and AP-5 laterals would cross areas of low incidence of and low susceptibility to landslides (Geosyntec, 2016). The entire SHP would cross areas where geologic and topographic conditions result in high susceptibility to landslides and where actual incidence of landslides is also high.

The locations along the pipeline route identified as high and medium threat level hazards are undergoing further analysis as part of a Phase 2 program that includes detailed mapping and potentially subsurface exploration by soil borings or deep test pits and engineering analysis. Atlantic has not yet completed the Phase 2 analysis at all evaluation sites.

Steep Slopes

ACP crosses 30.4 miles of slopes ranging from 20 percent to 35 percent and 11.6 miles of slopes greater than 35 percent in West Virginia; 28.8 miles of slopes ranging from 20 percent to 35 percent and 12.5 miles of slopes greater than 35 percent in Virginia; and approximately 0.3 mile of slopes ranging from 20 percent to 35 percent and less than 0.1 mile of slopes greater than 35 percent in North Carolina. SHP crosses 13.5 miles of slopes ranging from 20 percent to 35 percent and 10.7 miles of slopes greater than 35 percent.

The Geohazard Analysis Program identified slopes that warranted further evaluation as any slope that was:

- longer than 200 feet with slope greater than 58 percent;
- longer than 500 feet with slope between 40 percent and 58 percent;
- longer than 200 feet with segments that are a combination of slope greater than 58 percent and between 40 percent and 58 percent; and
- longer than 200 feet with a slope between 40 percent and 58 percent that are located on NFS land.

Based on these criteria, Geosyntec identified over 100 possible slope instability hazard locations along the AP-1 mainline where evidence suggests previous slope instability, or where the potential exists for slope instability, and 46 steep slopes that met the criteria for further evaluation used in the Geohazard Analysis Program. Geosyntec also identified 76 possible slope instability hazard locations along SHP (TL-635 loopline) where evidence suggests previous slope instability, or where the potential exists for slope instability, and 22 steep slopes that met the same evaluation criteria.

During construction of the pipeline facilities, activities on steep slopes could initiate localized slope movement. In addition, during operation, a naturally occurring landslide could damage the proposed facilities and create a potential safety hazard to nearby residents.

Atlantic and DETI attempted to avoid slip prone areas during the routing of ACP and SHP and completed a desktop analysis to inventory and categorize areas of slope instability as part of the Geohazards Analysis Program (Geosyntec, 2016). In addition, Atlantic and DETI attempted to cross topographic contours perpendicularly and minimize crossing of slopes greater than 30 degrees whenever practicable.

Atlantic and DETI are developing a Best in Class Steep Slope Management Program (BIC Team) to incorporate the results of the Geohazard Analysis Program into the project design and engineering and to address issues of landslide potential and susceptibility. Field reconnaissance and workshops are underway with subject matter experts to further identify, assess, and mitigate slope instability hazards. The

BIC Team is considering, but has not currently adopted, specific screening criteria for slopes that would be identified for site-specific requirements for construction and restoration. These criteria currently are:

- slopes longer than 100 feet with inclination greater than 58 percent;
- slopes longer than 150 feet with inclination between 40 percent and 58 percent; and
- slopes longer than 200 feet with inclination between 30 percent and 40 percent.

The BIC Team has identified six categories of steep slopes that occur on ACP and SHP and are potential hazards. Specific slopes may not fit a single category, but these categories are useful for identifying hazard conditions and preparing a set of standard mitigation designs for slope hazards. The categories are:

A. Steep slopes without evidence of previous movement.
B. Steep slopes with evidence of active movement.
C. Steep slopes with increased potential for instability when disturbed.
D. Steep slopes with narrow ridge tops.
E. Steep slopes with a sensitive resource at the toe.
F. Steep slopes previously modified by cutting and filling.

The BIC Team would develop standard mitigation designs for each of the six categories, drawing on industry techniques commonly utilized in pipeline construction, as well as industry-specific guidance, including "Mitigation of Land Movement in Steep and Rugged Terrain for Pipeline Projects" (INGAA, 2016).

In addition to the measures described above, Atlantic and DETI would implement the measures in its Slip Avoidance, Identification, Prevention, and Remediation - Policy and Procedure (SAIPR) to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction along the entire ACP and SHP. The SAIPR identifies engineering design methods that would be used for slip prevention and correction during construction, including:

- drainage improvement, including providing subsurface drainage at seep locations through granular fill and outlet pipes, incorporating drainage into trench breakers using granular fill, and/or intercepting groundwater seeps and diverting them from the right-of-way;

- buttressing slopes with Sakrete trench breakers;

- changing slope geometry by making the slope shallower;

- benching and re-grading with controlled backfill;

- using alternative backfill;

- chemical (e.g., cement, lime) stabilization of backfill;

- geogrid reinforced slope that consists of benching existing slope, installing subsurface drains, and incorporating Geogrid reinforcement into compacted backfill; and/or

- retaining structures.

In the event of a slip is discovered by an inspection, primarily conducted by geotechnical inspectors, during or following construction, the SAIPR identifies the steps that would be used for restoration of slips, including:

- notify DETI Engineering Management and Gas Environmental Business Support (GEBS), who would help evaluate priority of response, who would in turn notify appropriate FERC and appropriate state agencies. Additional federal and state agencies would be notified if the slip has or could impact a resource, such as a waterbody, wetland, threatened or endangered species, etc. The WVDNR WRS would be contacted within 48 hours if a slip or landslide occurs on the Lewis Wetzel WMA or Seneca State Forest;
- install temporary BMPs to prevent further slip, contain slip debris, and prevent impacts to waters of the state and US;
- collect data on the slip and submit to DETI;
- evaluate the data and select appropriate repair method;
- if applicable, place short term measures to stabilize the slip; and
- install and document final slip repair.

In addition, if geotechnical inspectors document the presence of potential indicators of instability, including tension cracks, slumping, erosion, or seeps, during construction and/or restoration, Atlantic and DETI would conduct additional analysis to confirm the effectiveness of mitigation measures and necessity of additional mitigation details.

Atlantic and DETI have not yet completed the Phase 2 analysis and field surveys at all evaluation sites, and final measures related to slope hazards have not yet been completed for ACP and SHP. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Atlantic and DETI should file with the Secretary:**
    - **a. all outstanding geotechnical studies for sites SL024, SS018, SL235, and SL239; geohazard analysis field reconnaissance of the 25 sites on the AP-1 mainline and 5 sites on the TL-635 loopline (as well as any additional geotechnical studies proposed following completion of site reconnaissance of these sites); and any mitigations proposed following the geotechnical studies and geohazard analysis field reconnaissance; and**
    - **b. status of the BIC Team analysis related to ACP and SHP.**

Atlantic would provide site-specific mitigation measures for the six steep slope categories in its construction plans as typical details. These plans would be stamped and sealed by a professional engineer-of-record registered in the state where the project is located and filed prior to construction.

We received several comments regarding the potential for cleared pipeline right-of-way within mountainous areas, including Nelson County, Virginia, to become more susceptible to rock slides and landslides. We also received several comments regarding the debris flows from Hurricane Camille, June 2016 flooding in West Virginia (including landslides within the MNF), and the potential for future storms to uncover and damage the pipeline in these areas. Estimates based on carbon dating of prehistoric debris flows in Virginia determined that an area of approximately 50 square miles has a debris flow recurrence interval on the order of 2,000 to 3,000 years; however, the recurrence interval for storms that produce debris flows across the Commonwealth of Virginia in the 20th century is on the order of every 15 to 20 years (Morgan et al., 1999). There is a higher probability that over the life of the project, two or more storm events could produce debris flows within the project area.

As discussed above, Atlantic and DETI would implement various measures to stabilize all areas of high risk for slope instabilities, as identified during its site-specific geotechnical studies. Further, to minimize impacts on potentially unstable soil and debris flows resulting from Hurricane Camille, Atlantic incorporated a route alternative (the East of Livingston Major Route Alternative) to avoid the debris flows and other features identified by the USGS (Morgan et al, 1999).

We received comments regarding a previous DETI pipeline project in West Virginia (the G-150 pipeline), where slope failures were observed following construction. DETI's BIC Program and SAIPR have been and continue to be revised to minimize and/or address slope failures. Further, the proposed facilities would be constructed of modern materials in accordance with the DOT's Minimum Federal Standards presented in 49 CFR 192, which are designed to provide adequate protection from washouts, floods, unstable soils, or landslides. Pipeline installation techniques, including padding and use of rock-free backfill, effectively insulate the pipe from minor earth movements.

4.1.4.3 Flash Flooding

Flash flooding has the potential to occur along waterbodies within the project area, particularly in areas with narrow river valleys, steep slopes, and rock bottoms. Flash flooding can also increase landslide potential within the project area by scouring steep slopes and eroding bedrock. Past coal strip-mining has also increased the anthropogenic impacts on flooding potential by over-steepening of slopes and disturbing and removing of overburden.

FEMA Flood Zones crossed by ACP and SHP are discussed in section 4.3.2.3. Approximately 41.3 miles of ACP facilities are located within the 100-year floodplain, with an additional 5.2 miles located within a 500-year floodplain. Additionally, the Fayetteville and Pembroke M&R Stations and Valve Site 21 are located within a 100-year floodplain and the Elizabeth River M&R Station is located within a 500-year floodplain (FEMA, 2016). Approximately 1.0 miles of SHP facilities are located within the 100-year floodplain. Some modifications to JB Tonkin Compressor Station are located within 100-year and/or 500-year floodplains, but the significant modifications are located outside of the floodplain.

Seasonal and flash flooding hazards are a potential concern where pipelines would cross or be located in the area of major streams and small watersheds. Although flooding itself does not generally present a risk to pipeline facilities, bank erosion and/or scour could expose the pipeline or cause sections of pipe to become unsupported. All pipeline facilities are required to be designed and constructed in accordance with DOT's regulations in 49 CFR 192. These regulations include specifications for installing the pipeline at a sufficient depth to avoid possible scour at waterway crossings.

Construction of ACP and SHP pipelines through 100-year floodplains would not result in the loss of floodplain storage as the pipelines are installed below the ground surface and would not displace flood waters. While M&R stations and valves do involve some above-ground infrastructure and piping, the facilities would be built on graveled lots that would allow for some infiltration of rainwater, at rates similar to surrounding vegetated areas. Construction of the aboveground facilities could result in a reduction of flood storage capacity within the floodplain, but we conclude it is minor based on the overall storage capacity of the affected floodplains. In addition, Atlantic and DETI would implement several mitigation measures within floodplains to minimize potential impacts from flood events. These measures include:

- clearing only the vegetation needed for safe construction of the pipeline;
- installing and maintaining erosion and sediment control structures;
- restoring floodplain contours and waterbody banks to their preconstruction condition; and
- conducting post-construction and operational right-of-way monitoring to ensure successful revegetation and to identify risks to the pipeline and above ground facilities after a flood event.

By implementing these measures, we conclude that the potential for flash floods to damage the proposed pipeline facilities or underground facilities has been adequately minimized.

4.1.4.4 Acid-Producing Rock and Soils

Acid-producing rocks and soils are found in areas where sulfide minerals (including iron pyrite, marcasite, and pyrrhotite) are present. Weathering of sulfides starts with exposure of the minerals to atmospheric oxygen and water, typically in the form of rain, snow, or humid air. The sulfide minerals oxidize to form sulfuric acid, which dissolves surrounding materials and generates an acidic metalliferous leachate. The leachate can degrade surface waters and corrode construction materials, including steel and concrete. Further, the sulfuric acid lowers the pH of the water allowing for the dissolution of metals into water. Acid mine drainage waters can have high concentrations of dissolved metals which can be harmful to the environment (Fraser Institute, 2012).

Geologic formations that contain sulfide minerals are found in various geologic and geomorphic settings across the project area. These settings include unconsolidated sulfide-rich near-coast sediments, some slate and phyllite formations, black shales, and sulfide-rich coal seams. Typically, the conditions necessary for acid rock drainage (ARD) are encountered in areas where mining is occurring or has occurred previously.

Atlantic and DETI consulted with geologic experts in each state crossed by ACP and SHP, including the Pennsylvania Department of Conservation and Natural Resources (PADCNR), West Virginia Geological and Economic Survey (WVGES), and VDMME, in addition to reviewing available geologic mapping, to identify geologic formations that are crossed by the projects that are known to contain acid-producing minerals. Table 4.1.4-1 summarizes crossing lengths for the identified formations. In addition, as discussed in section 4.1.3, the AP-1 mainline crosses reclaimed coal surface strip mines in West Virginia. Tailings may potentially be encountered in these areas that could be acid-producing.

Clearing and excavation activities during construction of ACP and SHP could expose acid-producing rocks or soils, which if improperly managed, could result in oxidation of sulfide minerals and the formation of ARD. Runoff of ARD could alter soil chemistry, affecting revegetation of disturbed areas, rendering areas more susceptible to erosion, as well as potential negative impacts to nearby wetlands, waterbodies, and both terrestrial and aquatic vegetation and wildlife.

TABLE 4.1.4-1

Geologic Units Containing Potentially Significant Acid-Producing Sulfide Minerals

Project or Physiographic Province or Unit/Formation	Crossing Length (miles)
ATLANTIC COAST PIPELINE	
West Virginia	
Dunkard Group	3.0
Millboro Shale	1.3
Monongahela Group	10.3
Virginia	
Alligator Back Formation	2.1
Ashe Formation	2.3
Candler Formation	5.0
Chesapeake Group	2.8
Millboro Shale and Needmore Formation	9.4
Tabb Formation	14.0
North Carolina	
Black Creek Formation	68.2
Felsic Metavolcanic Rock [a]	4.3
Terrace Deposits and Upland Sediment [b]	24.6
Subtotal	147.3
SUPPLY HEADER PROJECT	
Pennsylvania	
Casselman Formation	1.5
Glenshaw Formation	1.3
Monongahela Group	1.1
West Virginia	
Dunkard Group	33.6
Subtotal	37.5
TOTAL	184.8

Sources: Orndorff and Daniels, 2004; Pennsylvania Geologic Survey, 2005; Taylor, 2015; WVGES, 2015

[a] Felsic (high feldspar and silica content) metavolcanic rocks in the Project area may be interbedded with mafic (high magnesium and iron content) metavolcanic rocks. The mafic metavolcanic rock could contain some minerals that are acid-producing (Taylor, 2015).

[b] These materials have the potential to contain minor amounts of iron-oxide cemented sandstone, which could be acid-producing (Taylor, 2015).

Atlantic and DETI would limit the potential for acid-producing rocks or soils to become oxidized and produce ARD by attempting to limit stockpiling of these materials to 30 days or less. Prior to construction, Atlantic's and DETI's EIs would be trained to identify ARD and would survey areas for signs of acid-producing rocks, soil, and natural ARD, including but not limited to, staining on side slopes, sparse vegetation, and red-colored discharge. The EIs would observe excavation activity and open trenches during construction for signs of acid-producing rocks and soils and stockpiled rock and soil for evidence of iron oxidation and ARD. If acid-producing rocks or soil, or ARD are present, Atlantic and DETI would implement the following measures to minimize or avoid potential impacts from construction activities, including:

- segregation of the top 12 inches of topsoil or all the soil to the top of an acid-producing layer in the trench, whichever is encountered first;
- segregation of rock or soil from the top of the acid-producing layer to the bottom of the acid-producing layer, or to the bottom of the trench, whichever is encountered first;

- segregation of rock or soil below the acid-producing layer to the bottom of the trench;

- backfill of the trench with acid-producing rock or soil first to a maximum of 12 inches below the surface;

- placement of a cover of sand or other clean material around and over the pipe to avoid corrosion; and

- applying lime to the topsoil or replacing a minimum of 12 inches of topsoil with acid-free topsoil.

Acid-producing rocks, soil, and ARD could potentially accelerate the corrosion of the steel pipe installed by ACP and SHP. To inhibit external pipe corrosion, the outside of the pipes would be coated with a fusion-bonded epoxy. Atlantic and DETI would also install cathodic protection systems to inhibit corrosion of underground facilities. Atlantic and DETI would also follow federal requirements for corrosion mitigation and would conduct cathodic protection surveys and routine inspections to verify proper operating conditions.

We received comments regarding the potential expansion of rock and fill due to gypsum generation from ARD, and the subsequent potential that the expanded rock and fill could damage the pipe. Atlantic provided an analysis of potential impacts associated with gypsum production and associated rock expansion. Generally, the pipeline would be placed directly on the bottom of the excavated trench, and excavated spoil would not generally be placed beneath the pipeline to support it. In the event pyrite and calcite bearing material is placed beneath the pipeline, it would typically be less than 1 foot thick and would contain only a small percentage of pyrite and calcite by volume. Therefore, potential volume changes due to expansion of any calcite bearing material beneath the pipeline would be small, and potential expansion of any calcite bearing material in the backfilled trench beside and above the pipeline would be unconstrained (stress would be relieved at the ground surface). Even in the long term, the structural capacity of the welded high tensile steel pipeline and the relative freedom of the pipeline to move within the trench are expected to accommodate any anticipated external loads or pressure caused by expansion where pyritic and calcitic shale is encountered along the proposed pipeline trench. As such, we conclude the potential impacts associated with expanded rock and fill would be reduced.

4.1.4.5 Mine Subsidence

As discussed in section 4.1.3, the AP-1 mainline would cross 15 known abandoned underground coal mines in West Virginia and SHP would cross 1 known abandoned underground coal mine in Pennsylvania. In Virginia, coal adit may be present near Farmville, and there may be undocumented abandoned pits and shafts near AP-1 MPs 200 to 210. During project planning, Atlantic and DETI routed the projects to avoid mines and mining areas to the extent practicable; however, historic underground mining could affect ACP and SHP. Subsidence or collapse of underground mines could threaten the integrity of ACP and SHP facilities, creating a potential safety hazard.

The abandoned underground mines crossed by the projects are all room and pillar type with working depths several hundred feet below ground surface. Room and pillar mines are designed to leave columns of coal intact, which are often shored with timbers to provide sufficient support to keep the overlying bedrock from collapsing. Consequently, the surface above a room and pillar mine should not subside. On occasion, room and pillar mines are closed by removing portions of the remaining pillars to extract additional coal, which results in a deliberate and controlled collapse of parts of the mine that can cause surface subsidence. Unanticipated subsidence can occur if the remaining columns of coal and timbers deteriorate and collapse under the overhead weight. It is difficult to predict if or when failure of a room and pillar mine may occur or predict the magnitude of surface subsidence, unless precise mine location and dimensional data are available (PADEP, 2010). Surface subsidence due to room and pillar mining with less than 100 feet of cover could be as much as 50 percent of the vertical mining height. According to the PADEP, subsidence attributable to the collapse of room and pillar mining usually occurs where the vertical distance between the coal seam and surface is less than 50 feet (PADEP, 2010).

As discussed in section 4.1.4.2, Atlantic's and DETI's Geohazards Analysis Program also included a desktop review of ACP and SHP to identify potential areas with geologic hazards, including areas that have underground and surface mines (Geosyntec, 2017). Atlantic consulted with agencies and coal mine owners/operators to identify mines in the project area. Atlantic has stated that all known underground mines are located hundreds of feet below the ground surface, are room-and-pillar mines, and no impact is anticipated.

Atlantic and DETI would design, construct, and monitor the facilities in accordance with applicable industry standards and PHMSA regulations which are protective of public safety. Based on the types of underground mines present, we conclude the potential for underground mine collapse to damage the proposed facilities has been adequately avoided and minimized.

4.1.5 Paleontological Resources

Many geologic formations have the potential to contain paleontological resources; however, those containing vertebrate fossils are generally considered to be the most scientifically significant.

Atlantic and DETI consulted with geologic experts in each state crossed by ACP and SHP, including PADCNR, WVGES, VDMME, and NCGS, regarding the potential to encounter significant paleontological resources during construction of the projects (Kochanov, 2015; McDowell, 2015; Heller, 2015). No specific sites containing significant fossil resources were identified in the project area; however, geologic formations in Pennsylvania, West Virginia, and northwestern Virginia were identified that may contain marine invertebrates, animals, and fragmentary plant specimens. Atlantic and DETI noted that the potential for encountering significant paleontological specimens during pipeline construction is low, but rare specimens have been encountered in shallow excavations in the region.

The Newark Supergroup or Black Creek Formation, crossed by ACP in Virginia and North Carolina, has the potential to contain terrestrial and marine vertebrate fossils (Heller, 2015; NCGS, 1998). Two known fossil collection locations were identified in eastern North Carolina near ACP. Willis Creek, located approximately 1.7 miles to the southeast of AP-2 MP 157 in Cumberland County, has an exposure of Black Creek Formation where specimens of silicified logs and lignitized wood, seeds, and leaves have been collected (Heller, 2015). Quankey Creek, located approximately 2.7 miles east-southeast of AP-2 MP 18 in Halifax County, has an exposure of the Yorktown Formation where Pliocene-age bivalves have been collected (NCGS, 1998).

ACP and SHP are located beyond the southern edge of the Pleistocene ice margin. Surficial geology, therefore, is mostly composed of colluvium derived from the breakdown and weathering of the underlying bedrock or parent material and is often not suitable for the preservation of fossils, further limiting the potential for significant fossils to be found.

Potential impacts on fossil resources could include direct impacts such as damage to, or destruction of, fossils resulting from project construction activities, including excavation, trenching, or grading. Indirect effects on fossil beds could result from erosion caused by slope regrading, vegetation clearing, and/or unauthorized collection. No specific sites containing significant fossil resources were identified near ACP or SHP and it is not anticipated that construction of ACP and SHP would uncover significant paleontological resources, such as fossilized vertebrate remains (i.e. bones or teeth); however, the potential exists for significant paleontological materials to be uncovered during construction. To minimize impacts on paleontological resources that may be uncovered during construction, Atlantic's and DETI's EIs would be trained to observe for significant paleontological resources during the construction process. In the event significant paleontological resources are discovered during construction, Atlantic and DETI would notify the proper authorities (FERC, FS, PADCNR, WVGES, VDMME, or NCGS, as appropriate).

The VDMME provided comments on the draft EIS noting the potential presence of Tertiary or Quaternary vertebrate and plant fossils in unconsolidated deposits in Virginia, in addition to Paleozoic and Mesozoic fossil types discussed above. Therefore, to ensure that paleontological resources are adequately protected, **we recommend that**:

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, a *Plan for Discovery of Unanticipated Paleontological Resources* that describes how Atlantic and DETI would recognize and manage significant fossils encountered during construction. This plan should also describe the notification procedures to the appropriate authorities in each state crossed by ACP and SHP.**

Based on Atlantic's and DETI's efforts to address this issue as well as our recommendation, we conclude that significant paleontological resources, if encountered, would be adequately protected.

4.1.6 Geology on Federal Lands

4.1.6.1 Monongahela National Forest

The AP-1 mainline would cross 5.2 miles of the MNF in West Virginia. The project across the MNF is within the Appalachian Plateau Province and Valley and Ridge Province and is underlain by Silurian, Devonian, and Mississippian sedimentary rock (such as limestone, shale, siltstone, and sandstone) and by Quaternary deposits (such as colluvium). Within the MNF, the AP-1 mainline would cross the Millboro Shale, a potentially acid-producing rock between MP 80.8 and MP 80.9. No access roads within the MNF would cross acid-producing rocks. Approximately 3.6 miles of the shallow bedrock is crossed within the MNF and could require blasting per the SSURGO data. No known active or abandoned mines or oil and gas wells would be crossed by ACP in the MNF.

Risk of significant seismic activity within the MNF is relatively low. The USGS (Petersen et al., 2016) estimates in the areas crossed by ACP, there is a 2 percent chance for an earthquake to occur over the next 50 years (recurrence interval of 2,475 years) that would result in a PGA of between 0.06 g and 0.07 g. The USGS also estimates that there is a 10 percent chance for an earthquake to occur in the next 50 years (i.e., a recurrence interval of 475 years) that would result in a PGA of between 0.02 g and 0.03 g for the portions of the MNF crossed by ACP. ACP would not intersect any known, mapped, or interred active fault lines within the MNF (USGS, 2006), and given low PGA for the MNF, the potential for soil liquefaction is low.

The ACP route through the MNF crosses 4.4 miles (85 percent) of lands with high incidence of and high susceptibility to landslides, and crosses 1.9 miles of slopes ranging from 20 percent to 35 percent and 0.7 mile of slopes greater than 35 percent.

An overarching factor in potential impacts related to natural landslides and to project-induced landslides is the routing of the pipeline corridor through the mountainous areas, especially the routing on side slopes versus along ridgetops (ridgelines). Location (routing, siting), design, construction, and maintenance of the pipeline corridor are factors in potential impacts relating to slope instability. Location (routing, siting) is the most important factor in determining the short-term and long-term impacts relating to slope instability.

Most of ACP that crosses the MNF (82 percent) would be located along ridgetops. Installation along the ridgetop would avoid side slopes (including the colluvium-mantled hollows), which are the main geologic setting for natural landslides, such as debris slides and debris flows. Side slopes are a more hazardous geologic setting for project-induced landslides, such as potential cut slope and fill slope failures. The potential influence of groundwater on slope instability is less present on ridgetops than on side slopes. In addition, ridgetops can provide a more stable foundation for the pipeline than side slopes.

About 18 percent of the AP-1 mainline that crosses the MNF would be located on side slopes. The potential for natural landslides varies across side slopes as the geologic setting (and associated engineering geologic or geotechnical factors discussed above) varies horizontally and vertically across the side slopes. On side slopes, the pipeline would be installed perpendicular to contour, and typically climb from a stream crossing up a side slope to reach a ridgetop in the shortest distance. Steep slopes at the base of mountains next to stream crossings would be susceptible to natural landslides due to various factors such as rainfall-induced pore pressure increase or stream undercutting. In addition, steep slopes on the middle and upper mountainside may have the potential for natural landslides, such as debris slides, debris flows, and rockslides. These typically V-shaped crossings of the mountain valley slopes include a stream crossing that may be subject to debris flows type of landslides as well as flooding.

In the 18 percent of the pipeline corridor located perpendicular to contour on side slopes, Atlantic would construct cut slopes and fill slopes on steep slopes. As discussed above, these slopes are susceptible to natural landslides, and thus, the potential for project-induced landslides (cut slope, fill slope, and blasting-induced failures) is high. Because of the steep slopes, there is potential for failure of trench backfill and the backfill used to restore grades within the temporary right-of-way. Atlantic would implement measures to stabilize trench backfill and to stabilize backfill used to restore grades within the temporary right-of-way.

Atlantic's draft *COM Plan* identifies the conditions where ATWS would typically be required during construction of ACP on NFS lands, including ATWS measuring 50 feet by 150 feet that would typically be required on both sides of the construction corridor and both sides of the crossing at wetlands, waterbodies measuring greater than 10 feet in width, two lane roads, and railroads; and ATWS measuring 25 feet by 100 feet that would typically be required on both sides of the construction corridor and both sides of the crossing at waterbodies measuring less than 10 feet in width and single lane roads. The ATWS in these areas would increase the construction right-of-way to between 175 and 200 feet wide in certain areas (see appendix D).

Some of the ATWS that Atlantic has identified would be required in areas of steep or side slopes. In addition to the larger area of disturbance described above, the ATWS for stream crossings in the mountains' narrow valleys would be excavated into steep slopes at the base of the mountainside, which may be more susceptible to cut and fill slopes in the ATWS. Stream down cutting and incision in narrow mountain valleys would make these lower slopes near streams susceptible to stream or storm-induced landslides as well as to project-induced slope failures, such as by pipeline construction or access road construction/reconstruction.

While ridgetops generally are preferable to side slope construction, some ridgetop project locations have potential to result in project-induced landslides. Some ridgetops within the MNF have relatively gentle sloping ridgelines (such as where the route crosses top of Cloverlick Mountain), but some ridgetops have steeply sloping ridgelines (such as where route on the northwest side ridge of Cloverlick Mountain).

The steeply sloping ridgelines are perpendicular to the contours lines, and therefore, have some potential instability similar to steep side slopes which are perpendicular to the contours lines. The steeply sloping ridgelines have potential for natural landslides, but likely would have more potential for project-induced landslides (cut slope and fill slope failures). The Mauch Chunk geologic group present in the Cloverlick Mountain area increases risks for potential sliding due to the instability of shrink swell clays, which form from this geologic group. The FS is continuing to work with Atlantic on site-specific designs and performance-based standards which would be used to minimize the risks for sliding and other slope instabilities. These measures would be incorporated into the *COM Plan* with the goal of reducing the likelihood and magnitude of environmental effects as outlined in this section.

Another source of project-induced landslides are narrow ridgetops that require widening and flattening to provide workspace in the temporary right-of-way. The excavated material would likely swell in volume and may have reduced strength parameters if not properly compacted. This material may spill over the edge during construction, leaving a mass of loose material on steep slopes, which would be susceptible to failure. In addition, the swelled volume of material may create excess spoil that would need to be hauled to a suitable disposal site. In addition, piling excavated material on the excavated ridgetop could result in failure of the fill (backfill) slope, especially if the fill is not properly compacted.

Ridgetop construction, especially with steep slopes downslope, creates the potential for another type of project-induced landslide. Ridgetop construction can alter the surface and subsurface drainage along the ridgetop and in adjacent natural slopes receiving water drainage from the ridgetop construction. Changes in surface and subsurface drainage may create or contribute to failure of the natural slopes downhill from the pipeline.

Bedrock structure, the mass strength properties of bedrock and surficial materials (including soils and colluvium), groundwater conditions, and vegetation cover influence slope stability, but slope inclination is a fundamental controlling factor. Slope instability hazards increase with steeper slopes. Potential slope instabilities are discussed in section 6 of Atlantic's and DETI's Geotechnical Hazard Analysis of the *Geohazard Analysis Program Phase 2 Report* (August 2016). Slope inclinations and potential slope hazards along the pipeline route are provided in Appendices 6-1, 6-2, and 6-3.[6]

Slope classifications in the *Geohazard Analysis Program Phase 2 Report* include:

- Slopes inclined at less than 30 percent;
- Slopes inclined at 30 to 40 percent;
- Slopes inclined at 40 to 58 percent; and
- Slopes inclined steeper than 58 percent.

This information identifies steep slope locations such as those on the northwest flank of Cloverlick Mountain or the steep side slopes in the V-shaped drainage between AP-1 MPs 81.9 to 82.2.

A major concern is the potential failure of 1) temporary spoils during construction and 2) the restoration backfills during the following decades and the resulting potential debris flows than could travel hundreds or thousands of feet downslope with the potential to affect public safety, resources, and infrastructure on the NFS lands and non-federal lands downslope. However, the full scope of this fill slope hazard is not recognized in the industry-specific guidance "Mitigation of Land Movement in Steep and

[6] *Geohazard Analysis Program Phase 2 Report* (August 2016): appendix 6-1 – Potential Geotechnical Geohazards Summary Table; appendix 6-2 – Geologic Hazards Mapbook with Geology and Topographic Basemap; and appendix 6-3 – Geologic Hazards Mapbook with LiDAR Hillshade Basemap

Rugged Terrain for Pipeline Projects" (INGAA, 2016), which the BIC Team would use to develop mitigation designs for ACP (see section 4.1.4.2.).

According to INGAA (2016), "Smaller fills for road and residential/private development work are not addressed herein, because of their relative small size and corresponding relatively small potential for a hazard that may threaten a pipeline. The focus of this Typical Scenario is on larger scale fill areas, where the potential for a threat to the pipeline is increased, and the scale of the fill requires added planning and consideration. Common areas where fill is identified include existing drill pads and pipeline facility pads, valley fills where spoils have been placed as part of mining activities, large road fills, etc."

However, small fills on steep slopes can produce catastrophic debris flows. During a rainstorm, when a fill slope slumps or slides downhill and liquefies into debris flow, the debris flow has a "snowball effect" that increases the debris flow volume and destructive power as it gouges downslope scraping off and incorporating colluvium, weathered bedrock, trees, stream banks and bedload (Collins, 2008). A relatively small fill slope failure on a steep slope high on a mountain can initiate a debris flow that rapidly grows into a significant debris flow. For example, the Columbia Gas of Virginia pipeline construction on the Jefferson National Forest in Giles County, Virginia and Monroe County, West Virginia in 2014 resulted in a temporary spoil failure creating a debris flow into drainage areas below the pipeline corridor. Additionally, a September 2004 hurricane generated a fill slope failure on the BRP affecting the outside traffic lane along an 89-foot-long portion of the road. According to the FS, this fill slope failure swept downslope and rapidly grew into a major destructive debris flow gouging downslope for 9,500 feet across the Pisgah National Forest in North Carolina.

Restoring a slope to original contour, returning the topsoil, and reestablishing vegetation would not restore a slope to original condition, though it may appear so and create a false sense of security. ACP's cut and fill construction on steep slopes would result in permanent, alterations of geologic conditions. These alterations could affect slope stability due to:

- changes in the quantity, spatial distribution, and mass strength properties of unconsolidated materials (restoration backfill) overlying bedrock;
- excavating and remolding of intact colluvium, residuum, and bedrock and placing some back on the slope as fill and, in some cases, removing material from the site as excess excavation;
- changes in the depth, orientation, and physical characteristics of the contact between unconsolidated materials (original colluvium and residuum vs. backfill) and underlying bedrock;
- removal or undercutting of bedrock support of slope;
- excess temporary spoils (not needed for restoration backfill) added to the slope;
- changes in surface and subsurface drainage; and
- excavating bedrock and replacing it with fill and thus increasing the depth and quantity of unconsolidated materials overlying bedrock when the site is restored to original contour.

In recognition of the potential slope stability hazards, especially for temporary spoils and restoration backfills, the FS requested that Atlantic provide site-specific designs for route segments representative of steep slope construction. Atlantic has provided a Geohazard Mitigation Site-Specific

Design for AP-1 MPs 73.20 to 73.50 for pipeline construction on 2,900 feet of sloping ridge on the northwest flank of Cloverlick Mountain.[7] During the trench excavation and pipeline construction, the existing ground surface would be temporarily graded to an approximately planar working surface within the temporary right-of-way and extra workspace; this surface is called "temporary ground" and is above and outside the trench. The Cut Fill Plan for the temporary ground shows cuts ranging from 0 to 17 feet deep, fills (temporary spoils) ranging from 0 to 11 feet deep, and a cut volume of 17,756 cubic yards (CY) for the construction along the 2,900 feet of sloping ridge. Because the cut material when excavated would swell or bulk in volume, the computation analysis applied a bulking factor of 1.4 to the cut volume, resulting in a fill (temporary spoils) volume of 24,858 CY, which includes 7,054 CY of excess grade spoils.

Bulked trench excavation volume would be 10,926 CY, and after adjusting for trench breakers and 42-inch-diameter pipeline volumes, would yield 4,676 CY of excess grade spoils from the trench. Combing the bulked volume for the temporary ground and the trench yields a fill (temporary spoils) volume of 35,874 CY, including 11,779 CY of excess grade spoils. Restoration to original contour would use about 24,000 CY of the temporary spoils as restoration fill (backfill). As currently described, the 11,779 CY of temporary spoils that would be excess to restoration backfill needs would be spread across the construction right-of-way and extra workspace during restoration.

The potential slope stability hazards for pipeline construction of the 2,900 feet of sloping ridge on the northwest flank of Cloverlick Mountain include the potential for:

1) failure of temporary spoils during the construction period;
2) failure of the restoration fill (backfill) during the decades after the construction period; and
3) failure of excess temporary spoils during the decades after the construction period.

A failure of temporary spoils or the restoration backfill on the northwest flank of Cloverlick Mountain could result in a debris flow that would travel far downslope and impact federal and non-federal lands, with potential risks to public safety, infrastructure, and resources such karst features.

ACP's site-specific design on the northwest flank of Cloverlick Mountain is informed by and is part of the BIC Team as well as the SAIPR developed to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction. ACP design analysis did consider the potential hazards of failure of the temporary spoils, the restoration fill, and the excess temporary spoils, and then developed designs to avoid, minimize, and mitigate the potential hazards. The design includes at least 19 BIC controls. Atlantic also provided a site-specific design for steep side slope construction at MP 84.95 to MP 85.05 on the GWNF, which is one of the steepest slope construction sites on either the MNF or GWNF. Thus, Atlantic has provided site-specific designs for the two main types of steep slope construction on both the MNF and GWNF: 1) ridgetop construction, and 2) side slope construction. The ACP design provided the cross-sections and profiles of the 1) original ground surface, 2) the temporary ground surface of cuts and fills (temporary spoils), and 3) final ground (restoration backfill to original contour). The designs, cross-sections, and profiles provide information the FS would use to focus on construction inspection.

If ACP is authorized, the FS would require that the site-specific designs for these two sites as well as another eight sites identified in the October 24, 2016 FS letter to FERC be approved by the FS before

[7] Site-specific drawings and analysis can be found in appendix C of the January 10, 2017 supplemental filing under FERC Accession No. 20170110-5142 at the following location: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170110-5142

Additional and updated site-specific steep slope analysis can be found under FERC Accession No. 20170522-5016 at the following location: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170522-5016.

construction at those locations could begin. The FS would also require construction monitoring by geotechnical professionals (engineering geologists and geotechnical engineers) to review construction implementation of design and proposed modifications of designs, for example, due to unforeseen conditions. The FS would also require prior approval before alternative backfill material or chemical stabilization of backfill is allowed. The material must be free of contaminants and invasive species.

Information and perspective relevant to long-term potential effects of the ACP pipeline corridor is provided by the Columbia pipeline corridor which was has been on the MNF since the 1950s. About 11.4 miles of proposed WB Xpress Project would replace pipeline within the Columbia pipeline corridor on the MNF in Randolph and Pendleton Counties, West Virginia. Tables 4.1.6-1 and 4.1.6-2 display results of a GIS analysis using MNF digital elevation model data that shows slope inclination along the centerline of the proposed ACP and the existing Columbia pipeline corridor.

TABLE 4.1.6-1

Results of Slope Inclination Analysis on Atlantic Coast Pipeline Centerline on Monongahela National Forest

Slope inclination (percent)	Length of route (miles)	Length of route (percent)
0-10	0.9	18
10-20	1.4	27
20-30	1.4	28
30-40	0.8	16
40-50	0.5	9
50-60	0.1	2

TABLE 4.1.6-2

Results of Slope Inclination Analysis on WB Xpress Pipeline Centerline on Monongahela National Forest

Slope inclination (percent)	Length of route (miles)	Length of route (percent)
0-10	2.3	20
10-20	4.1	35
20-30	2.6	22
30-40	1.5	13
40-50	0.8	7
50-60	0.3	2
60+	0.1	1

Comparison of tables 4.1.6-1 and 4.1.6-2 shows the percentage distribution of slope classes between ACP and the existing Columbia pipeline is generally similar, with about 89 percent or 90 percent of the slopes in the 0-40 percent class, and 11 percent or 10 percent in the greater than 40 percent classes. The WB XPress Project Environmental Assessment (EA) (issued March 2017 under Docket No. CP16-38-000) documented the studies to identify and assess landslide hazards along the 11.4 miles of existing Columbia pipeline corridor. The EA (p. 59) found: “In general, widespread evidence of slow, natural soil creep-type movement was observed in the form of undulating, “hummocky” ground surface, bent/leaning trees, exposed tree roots, etc.” The EA did not find widespread or chronic project-induced slope failures along the 11.4 miles of existing Columbia pipeline corridor. There may have been some project-induced slope failures during the construction in 1950s or since then such as during the flood event of 1985.

There are differences between ACP and corridor and the Columbia pipeline project and corridor, and so, there can be more potential for project-induced slope failures in the ACP corridor. But the decades of slope stability performance of the Columbia pipeline corridor on slopes generally similar to those along the ACP pipeline route is relevant information to consider. The existing Columbia pipeline was constructed before NEPA and does not have the benefit of the geotechnical analysis and slope stability technology available today. The 11.4 miles of existing Columbia pipeline examined for slope failures in the WB XPress Project EA is twice as long as the 5.2 miles of the proposed ACP.

In summary regarding landslides and slope stability, the routing of ACP and the slope stability design and construction practices would reduce, but not eliminate, the slope stability hazards. The ridgetop routing of 82 percent of the ACP corridor on the MNF would be a major reduction in potential hazards from natural landslides. The ridgetop routing (82 percent) compared to side slope routing (18 percent) would also be a major reduction in potential hazards of project-induced landslides (cut slope and fill slope failures). The BIC Team and the SAIPR provide design and construction practices that would reduce the potential for project-induced landslides. With due recognition of these major reductions in potential hazards, there remains increased potential for 1) failures of temporary spoils during construction, 2) failure of restoration fills and excess temporary spoils during the decades after construction, and 3) associated risks to public safety, resources, and infrastructure. Access roads including existing roads upgraded for the project have the potential to result in unstable slopes including cut slope failures and fill slope failures.

No FEMA Flood Zones are crossed within the MNF. However, FS has identified flooding hazards that are present at a few stream crossings of the pipeline and access roads on NFS lands. The strategy of locating the pipeline route on ridgetops to avoid landslide hazards where possible also avoids stream crossings and flood hazards. As discussed above, most of the pipeline corridor (82 percent) would be located along ridgetops.

The proposed AP-1 mainline crosses 1.0 mile of karst terrain as defined by USGS (Weary and Doctor, 2014) on the MNF. As presented in Atlantic's *Karst Survey Report*, two small (6-foot-diameter), shallow, sinkholes were identified within 20 feet of the proposed centerline within the MNF. Both sinkholes are designated as having a high risk of impact from construction due to proximity to the proposed centerline and due to their apparent receipt of surface drainage. The project has the potential to adversely impact karst features and resources, including groundwater, by an accidental release of contaminants. Implementation of the mitigation procedures described in section 4.1.2.3 along with Atlantic's construction and restoration plans would avoid or minimize impacts on karst features on federal lands.

No fossil sites have been identified along the AP-1 within the MNF, however, geologic formations in West Virginia and northwestern Virginia were identified that may contain marine invertebrates, animals, and fragmentary plant specimens. To minimize impacts on paleontological resources that may be uncovered during construction, Atlantic's and DETI's EIs would be trained to observe for significant paleontological resources during the construction process. In the event significant paleontological resources are discovered during construction, Atlantic and DETI would notify the proper authorities, including the FERC and FS.

4.1.6.2 George Washington National Forest

The AP-1 mainline would cross approximately 16.0 miles of the GWNF at several locations in Virginia. The project across the GWNF is located within the Valley and Ridge and Blue Ridge Provinces and is underlain by Devonian, Silurian, and Cambrian sedimentary rock (such as sandstone, shale, siltstone, and limestone), Precambrian metabasalt, and Quaternary deposits (such as colluvium). The Millboro Shale and Needmore Formation crossed by AP-1 between MPs 122.6 to 122.8 may contain acid-producing rocks. No access roads would be required on the GWNF that cross acid-producing rocks. Depth to bedrock may be 5 feet or less over most of the ACP route through the GWNF as determined from SSURGO data. Approximately 8.0 miles of the shallow bedrock is crossed within the GWNF and could require blasting per SSURGO data. No known active or abandoned mines or oil and gas wells would be crossed by ACP in the GWNF.

Risk of significant seismic activity within the GWNF is relatively low. The USGS (Petersen et al., 2016) estimates in the areas crossed by ACP, there is a 2 percent chance for an earthquake to occur over the next 50 years (recurrence interval of 2,475 years) that would result in a PGA of between 0.07 g and 0.09 g. The USGS also estimates that there is a 10 percent chance for an earthquake to occur in the next 50 years (i.e., a recurrence interval of 475 years) that would result in a PGA between 0.02 g and 0.03 g where ACP crosses the GWNF. Additionally, ACP would not intersect any known, mapped, or interred active fault lines within the GWNF (USGS, 2006), and the potential for soil liquefaction is low.

The ACP route through the GWNF crosses 9.3 miles (58 percent) of lands with high incidence of and high susceptibility to landslides and 6.6 miles (41 percent) of lands with a moderate incidence of and high susceptibility to landslides. ACP crosses 4.4 miles of slopes ranging from 20 percent to 35 percent and 9.4 miles of slopes greater than 35 percent through the GWNF. Potential natural landslides in the project area include a variety of mass movements such as debris slides, debris flows, rockslides, rockfalls, and slumps. Debris flows (also referred to as mudslides, mudflows, or debris avalanches) are the dominant type of rapid, catastrophic landslide (Wooten et al., 2015; Eaton et al., 2003; Sas and Eaton, 2008; Morgan et al., 1999; USGS, 1996; Jacobson et al., 1993; Clark, 1987; Hack and Goodlett, 1960).

Most of the AP-1 mainline that crosses the GWNF (65 percent) would be located along ridgetops (ridgelines). The ridgetop location (such as Camp Ridge, Big Ridge, and Big Crooked Ridge) avoids the side slopes (including the colluvium-mantled hollows), which are the main geologic setting for natural landslides, such as debris slides and debris flows. The ridgetop location avoids side slopes (including the colluvium-mantled hollows) which are a more hazardous geologic setting for project-induced landslides such as potential cut slope and fill slope failures. The potential influence of groundwater on slope instability is less on ridgetops than on side slopes. The ridgetops can provide a more stable foundation for the pipeline than side slopes.

About 35 percent of ACP AP-1 that crosses the GWNF would be located on side slopes which are the geologic setting for natural landslides. The potential for natural landslides varies across side slopes as the geologic setting (and associated engineering geologic or geotechnical factors discussed above) varies horizontally and vertically across the side slopes. About 28 percent of ACP AP-1 that crosses the GWNF would be located perpendicular to contour on side slopes, and typically climbing from a stream crossing up a side slope to reach a ridgetop in the shortest distance. About 7 percent of ACP AP-1 that crosses the GWNF would be located parallel to contour on side slopes. Steep slopes at base of mountains next to stream crossings are susceptible to natural landslides due to various factors such as rainfall-induced pore pressure increase or stream undercutting. In addition, steep slopes on the middle and upper mountainside may have potential for natural landslides such as debris slides, debris flows, and rockslides. These typically V-shaped crossings of the mountain valley slopes include stream crossings which may be subject to debris flows type of landslides as well as flooding.

Where located perpendicular to contour on side slopes, the project would be constructing cut slopes and fill slopes on steep slopes, which are susceptible to natural landslides, and as a result, the potential for project-induced landslides (cut slope, fill slope, and blasting-induced failures) is high. Because of the steep slopes, there is potential for failure of trench backfill and the backfill used to restore to original contours in the rest of the temporary right-of-way. Mitigation measures would be used to stabilize the trench backfill and the backfill used to restore original contours within the temporary right-of-way. Also, the typical V-shaped crossings of the mountain valley slopes include stream crossings that require ATWS and associated excavation on the side slopes adjacent to the temporary right-of-way. For example, the pipeline corridor with ATWS is located perpendicular to contour on steep side slopes 1) on the north flank and south flank of Little Ridge and Steep Pinch Ridge in the Townsend Draft watershed, and 2) on the east end of Camp Ridge above an unnamed tributary of White Oak Draft.

As discussed above (see section 4.1.6.1), the ATWS required during construction of ACP on GWNF lands would increase the area of disturbance to between 175 feet and 200 feet wide in certain areas. On the GWNF, more than 80 ATWS would be required. In addition to the larger area of disturbance, the ATWS for stream crossings in the mountains narrow valleys would be excavated into steep slopes at the base of the mountainside, such as the flanks of Little Ridge and Steep Pinch Ridge or the east end of Camp Ridge. Stream down cutting and incision in narrow mountain valleys would make these lower slopes near streams susceptible to stream or storm-induced landslides as well as project-induced slope failures, such as by pipeline construction or access road construction/reconstruction. Because of the steep slopes, there is potential for failure of cut slopes and fill (backfill) slopes in the ATWS.

About 7 percent of the AP-1 mainline is located parallel to contour on side slopes along the western lower slopes of the Blue Ridge. The pipeline in this area would have potential to be affected by natural landslides, including debris flows at creek crossings. The construction across side slopes has potential to create project-induced landslides that could affect public safety, resources, and infrastructure on the NFS lands upslope and downslope as well as within the pipeline corridor.

While ridgetops generally are preferable to side slope project locations, some ridgetop project locations have potential to result in project-induced landslides. Some ridgetops have relatively gentle sloping ridgelines (such as Big Ridge near AP-1 MP 86), but some ridgetops have steeply sloping ridgelines (such as the side ridge from the crest of Big Ridge down to the ATWS on Lick Draft). The steeply sloping ridgelines are perpendicular to the contours lines, and therefore, have some potential instability similar to steep side slopes which are perpendicular to the contours lines. The steeply sloping ridgelines have potential for natural landslides, but likely would have more potential for project-induced landslides (cut slope, fill slope, and blasting-induced failures).

Another source of project-induced landslides are narrow ridgetops that require widening and flattening to provide workspace in the temporary right-of-way. An example of a narrow ridgetop with potential for project-induced landslides is along Big Ridge between AP-1 MPs 86.5 and 87.2 where "The alignment follows a ridge crest with steep slopes identified along either side of the route. The centerline has been mapped slightly off the ridge crest, thus causing the route to apparently intersect steep slopes that would be avoided if the centerline were on top of the ridge crest. The ridge crest is very narrow is some places (~20 feet wide)" according to Atlantic's Geohazards Summary Table (appendix 6-1, Geohazard Phase 2 Report).

Another overarching factor in slope stability is the slope inclination. Other factors such as bedrock structure, the mass strength properties of bedrock and surficial materials including soils and colluvium, groundwater conditions, and vegetation cover influence slope stability, but slope inclination is a fundamental controlling factor. Slope instability hazards increase with steeper slopes. Potential slope instabilities are discussed in section 6 Geotechnical Hazard Analysis of the *Geohazard Analysis Program Phase 2 Report*, Atlantic Coast Pipeline and Supply Header Project, August 2016. Slope inclinations and potential slope hazards along the pipeline route are displayed in the August 2016 Report Appendices:

- Appendix 6-1 – Potential Geotechnical Geohazards Summary Table
- Appendix 6-2 – Geologic Hazards Mapbook with Geology and Topographic Basemap
- Appendix 6-3 – Geologic Hazards Mapbook with LiDAR Hillshade Basemap

The slope classification in the August 2016 Report is:

- Slopes inclined at less than 30 percent;
- Slopes inclined at 30 to 40 percent;
- Slopes inclined at 40 to 58 percent; and

- Slopes inclined steeper than 58 percent

The FS conducted a slope inclination analysis of the ACP route centerline using GWNF GIS DEM data. Table 4.1.6-3 summarizes the results.

TABLE 4.1.6-3

Results of Slope Inclination Analysis on Atlantic Coast Pipeline Centerline on George Washington National Forest

Slope inclination (percent)	Length of route (miles)	Length of route (percent)
0-10	2.8	18
10-20	3.7	23
20-30	3.9	25
30-40	2.9	19
40-50	1.4	9
50-60	0.6	4
60+	0.4	2

Mitigation measures for landslide hazards on the GWNF would be similar to those described for ACP on MNF lands (see section 4.1.6.1). The FS would also require prior approval before alternative backfill material or chemical stabilization of backfill is allowed. The material must be free of contaminants and invasive species.

We recommended in the draft EIS that Atlantic file plans and typical drawings, as well as site-specific designs of representative construction segments, to display the magnitude of the proposed slope modifications (cuts and fills) for the GWNF as requested by the FS. In response, Atlantic filed site-specific geohazard mitigation design drawings and related materials (such as Geohazard Computation Analysis GWNF site ACP AP-1 MPs 84.95 to 85.05) for a steep slope site within the GWNF between AP-1 MPs 84.95 and 85.05. The 600-foot length design extends from the ridgetop of Little Ridge down the steep southwest side slope to a tributary of Townsend Draft. On lower slope next to the tributary, the slope inclinations range from 30 degrees (58 percent) to 52 degrees (128 percent).

On upper slope extending to the ridgetop, the slope inclinations generally vary between 22 degrees (40 percent) and 34 degrees (68 percent), with relatively shorter segments where slope inclination is as high as 40 degrees (84 percent). Atlantic's submittal also addressed several the BIC controls that would be employed to address slope stability hazards. Similar to the discussion for MNF lands, if ACP is authorized, the FS would work with Atlantic on review and approval of mitigation tailored to site-specific designs of these and other steep slope sites on the Forest.

The Cut Fill Plan for the temporary ground shows cuts ranging from 0 to 20 feet deep, and fills (temporary spoils) ranging from 0 to 10 feet deep, and a cut volume of 5,169 CY for the construction length of 600 feet. The "temporary ground" is the ground above and outside the trench. The deepest cuts (6 to 20 feet) would be on the ridgetop to provide a level area for the winch pad. Because the cut material when excavated would swell or bulk in volume, the computation analysis applied a bulking factor of 1.4 to the cut volume, resulting in a fill (temporary spoils) volume of 7,237 CY, which includes 3,904 CY of excess grade spoils.

Bulked trench excavation volume would be 3,543 CY, and after adjusting volumes for trench breakers, 42-inch-diameter pipeline, Sakrete, and riprap armor, would yield 1,856 CY of excess grade spoils from the trench. Combining the bulked volume for the temporary ground and the trench yields a fill (temporary spoils) volume of 10,780 CY, including 5,760 CY of excess grade spoils. The design calculates that nearly all the 1,856 CY of excess trench spoils can be used on site to restore the final ground (restoration backfill). As currently described, the 3,904 CY of temporary spoils that would be excess to restoration backfill needs would require removal off-site during grading or relocation to the ridge within the construction right-of-way and extra workspace.

The FS requested site-specific design of this site on the southwest flank of Little Ridge because it is one of the most challenging steep slope construction sites on the MNF or GWNF, and is representative of “worst case” construction sites. ACP design use of soil nails, Sakrete, and riprap on the lower slope is a rational approach to addressing slope stability. The design for the upper slope identified the need to consider the disposal of temporary spoils that would be excess to restoration backfill needs, and offered two options. The FS is concerned about large volumes of ridgetop cuts being placed as temporary spoils on the steep slopes below the ridgetop, not only because of the potential for failure during construction but also because of the difficulty of retrieving temporary spoils from the steep slopes. Therefore, the FS would concur with the design option of removing those temporary spoils off-site to a suitable disposal area. The ACP design provided the cross-sections and profiles of the 1) original ground surface, 2) temporary ground surface of cuts and fills (temporary spoils), and 3) final ground (restoration backfill to original contour). The designs and cross-sections and profiles provide information that the FS would use to focus on its construction inspections.

The potential slope stability hazards for pipeline construction include the potential for:

1) failure of base of slope during excavation for scakcrete and riprap armor;
2) failure of slope due to blast excavation;
3) failure of temporary spoils during the construction period;
4) failure of the restoration fill (backfill) during the decades after the construction period; and
5) failure of excess temporary spoils during the decades after the construction period.

A failure of temporary spoils or the restoration backfill on the flank or ridgetop of Little Ridge could result in a debris flow that would travel far downslope and impact federal and non-federal lands, with potential risks to public safety, resources, and infrastructure. In general, debris flow hazards have the potential to put at risk non-federal lands downslope or downstream, especially if the hazard would be within 0.5 mile of the Forest external boundary, such as in Townsend Draft, Erwin Draft, Jennings Branch, and Stoutamayer Branch. Some debris flow hazards farther than 0.5 mile from the Forest boundary may also put at risk non-federal lands downslope or downstream, but generally the closer the hazard is to the boundary the greater the hazard would be to non-federal lands.

Information and perspective relevant to long-term potential effects of the ACP pipeline corridor is provided by the Columbia pipeline corridor which was has been on the MNF and GWNF since the 1950s (see discussion in section 4.1.6.1).

In summary regarding landslides and slope stability, the routing of the ACP corridor and the slope stability design and construction practices would reduce, but not eliminate, the slope stability hazards. The ridgetop routing of 65 percent of the ACP corridor on the GWNF would be a major reduction in potential hazards from natural landslides. The ridgetop routing (65 percent) compared to side slope routing (35 percent) also would be a major reduction in potential hazards of project-induced landslides (cut slope and fill slope failures). The BIC Team and the SAIPR provided design and construction practices that would reduce the potential for project-induced landslides. With due recognition of these major reductions in potential hazards, there remains increased potential for 1) failures of temporary spoils during construction, 2) failure of restoration fills and excess temporary spoils during the decades after construction, and 3) associated risks to public safety, resources, and infrastructure. Access roads, including existing roads upgraded for the project, have the potential to result in unstable slopes, including cut slope failures and fill slope failures. The ACP segment on the GWNF between the Virginia and West Virginia state line (MP 83.9) and the end of the Big Ridge ridgetop (MP 86.9) has 1) narrow ridges above steep slopes and 2) steep side slopes in the V-shaped drainages, and has the highest potential for project-induced slope failures on the GWNF.

Two FEMA Flood Zones are crossed within the footprint of the GWNF: one at Braley Branch at MP 116.5 and the other at Calfpasture River at MP 116.7; however, FS noted that these crossings are located downslope from the GWNF on private land. FS has identified flooding hazards are present at about 36 stream crossings of the pipeline and access roads on GWNF lands. The strategy of locating the pipeline route on ridgetops to avoid landslide hazards where possible also avoids stream crossings and flood hazards; the majority of the AP-1 mainline on the GWNF (65 percent) would be located along ridgetops.

The proposed AP-1 mainline crosses 1.4 miles of karst terrain as defined by the USGS (Weary and Doctor, 2014) on the GWNF. Most notably, several caves in Bath County, Virginia between approximate AP-1 MPs 94.0 and 100.0 are within the GWNF. The pipeline crosses karst terrain in Poplar Hollow near AP-1 MP 97 and on Brushy Ridge near AP-1 MP 106. In addition, one access road crosses karst terrain in vicinity of Browns Pond. As presented in Atlantic's *Karst Survey Report*, MPs 96.8 to 97.2 have not been surveyed due to lack landowner permission. Karst surveys of MPs 105.8 to 105.9 and MPs 122.8 to 123.4 have been completed and one feature, a sinking stream section, has been identified downgradient of the proposed centerline. This sinking stream is designated as having a moderate risk of impact from construction due to proximity to the proposed centerline and due to drainage characteristics. ACP has the potential to adversely impact karst features and resources, including groundwater, by an accidental spill of contaminants. Implementation of the mitigation procedures described in section 4.1.2.3 along with Atlantic's construction and restoration plans would avoid or minimize impacts on karst features on federal lands.

No fossil sites have been identified along the AP-1 within the GWNF, however, geologic formations in northwestern Virginia were identified that may contain marine invertebrates, animals, and fragmentary plant specimens. To minimize impacts on paleontological resources that may be uncovered during construction, Atlantic's and DETI's EIs would be trained to observe for significant paleontological resources during the construction process. In the event significant paleontological resources are discovered during construction, Atlantic and DETI would notify the proper authorities, including the FERC and FS.

4.1.7 Conclusion

ACP and SHP would traverse a range of geologic conditions and resources, including karst sensitive areas. Impacts on geologic resources range from not significant to locally significant, depending on the resource or hazard in question. We conclude that constructing and operating ACP and SHP facilities in accordance with the Atlantic's and DETI's construction and restoration plans would not result in a significant impact on mineral or paleontological resources or have a noticeable effect on acid rock drainage. Additionally, the potential for floods, earthquakes, soil liquefaction, or mine subsidence to affect the project facilities is low and effectively mitigated.

While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted. These measures may have bearing on the likelihood and magnitude of environmental effects outlined above. Additionally, although the proposed pipelines have been cited to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the factors above, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur. However, Atlantic and DETI would comply with DOT regulations, specifically 49

CFR 192.317(a), which require pipeline operators to protect transmission pipelines from hazards, including landslides. Regulations at 49 CFR 192 also specify pipeline design requirements to ensure safe pipeline operation and include pipe stress requirements/testing and requires consideration of external loads in pipeline design. Adherence to DOT's pipeline safety regulations would minimize the risk of landslides in the project area. However, Atlantic and DETI are currently working to provide documentation of the likelihood that their proposed design features and mitigation measures would minimize the risk of landslides in the project area.

Atlantic and DETI conducted studies to characterize karst conditions and developed project-specific plans and procedures that would minimize the potential for karst impacts that could result from constructing and operating the proposed facilities. While small, localized, and temporary impacts on karst features, water flow, and water quality could occur, the impacts would be minimized and mitigated through Atlantic's and DETI's plans.

4.2 SOILS

4.2.1 Existing Soil Resources

The NRCS Major Land Resource Areas (MLRAs) geographic database was used to generally characterize soil resources in the project area. MLRAs are geographical concepts based on subdivisions within a land resource region that identify areas with similar physiography, geology, climate, water resources, soils, biological resources, and land use (NRCS, 2016a). ACP and SHP are located within nine MLRAs, which are described below and identified in table 4.2.1-1.

TABLE 4.2.1-1

Land Resource Regions and Major Land Resource Areas Crossed by the Atlantic Coast Pipeline and Supply Header Project

		Atlantic Coast Pipeline	Supply Header Project
Land Resource Region (LRR)	Major Land Resource Area	(miles)	
East and Central Farming and Forest Region	Central Allegheny Plateau (126)	29.4	37.5
	Eastern Allegheny Plateau and Mountains (127)	55.8	--
	Northern Blue Ridge (130A)	15.1	--
	LRR Total	100.3	37.5
Northern Atlantic Slope Diversified Farming Region	Northern Appalachian Ridges and Valleys (147)	97.2	--
	Northern Piedmont (148)	10.4	--
	LRR Total	107.5	--
South Atlantic and Gulf Slope Cash Crops, Forest, and Livestock Region	Southern Coastal Plain (133A)	209.7	--
	Southern Piedmont (136)	113.5	--
	LRR Total	323.2	--
Atlantic and Gulf Coast Lowland Forest and Crop Region	Atlantic Coast Flatwoods (153A)	54.2	--
	Tidewater Area (153B)	19.3	--
	LRR Total	73.5	--
	Project Total	604.5	37.5

The Central Allegheny Plateau MLRA (126) consists of dissected plateau with narrow valleys and ridgetops separated by long and steep side slopes. The soils in this MLRA are commonly shallow to very deep, skeletal to clayey soils with a mesic temperature regime, an udic moisture regime, and mixed mineralogy. About 29.4 miles (5 percent) of ACP pipeline facilities and 37.5 miles (100 percent) of SHP pipeline facilities would be within MLRA 126.

The Eastern Allegheny Plateau and Mountains MLRA (127) consists of deeply dissected plateau terminating in a high escarpment. Steep slopes are prevalent as well as level to gently rolling plateau remnants. The soils in this MLRA are moderately deep to very deep, loamy soils with a mesic or frigid temperature regime, an udic or perudic moisture regime, and mixed or siliceous mineralogy. About 55.8 miles (9 percent) of ACP pipeline facilities would be within MLRA 127.

The Northern Blue Ridge MLRA (130A) consists of rugged mountains with steep slopes, sharp crests, and narrow valleys. Major streams flow through gorges and gaps in the mountains. Broad valleys and basins and rolling hills are also prevalent in this MLRA. The soils in this MLRA are commonly moderately deep to very deep, sandy-skeletal to clayey soils that have a mesic temperature regime, an udic moisture regime, and mixed mineralogy. About 15.1 miles (3 percent) of ACP pipeline facilities would be within MLRA 130A.

The Northern Appalachian Ridges and Valleys MLRA (147) consists of folded and faulted region of ridges and valleys carved out of synclines, anticlines, and thrust blocks. The soils in this MLRA are commonly shallow to very deep, loamy or clayey soils that have a mesic temperature regime, an udic moisture regime, and mixed or siliceous mineralogy. About 97.2 miles (16 percent) of ACP pipeline facilities would be MLRA 147.

The Northern Piedmont MLRA (148) consists of gently sloping to sloping topography. Intrusive dikes and sills form sharp ridges that break-up the less steep terrain. The soils in this MLRA are commonly moderately deep to very deep, loamy or loamy-skeletal soils that have a mesic temperature regime, an udic moisture regime, and kaolinitic, micaceous, or mixed mineralogy. About 10.4 miles (2 percent) of ACP pipeline facilities would be within MLRA 148.

The Southern Coastal Plain MLRA (133A) consists of unconsolidated coastal plain sediments underlain by eroded igneous and metamorphic bedrock. The soils common to this MLRA are generally very deep, somewhat excessively drained to poorly drained, and loamy soils. About 209.7 miles (34 percent) of ACP pipeline facilities would be within MLRA 133A.

The Southern Piedmont MLRA (136) consists of rolling to hilly uplands with well-defined drainage patterns underlain largely by metamorphic and igneous rocks. The soils in this MLRA are commonly shallow to very deep, generally well-drained loams or clays. About 113.5 miles (19 percent) of ACP pipeline facilities would be within MLRA 136.

The Atlantic Coast Flatwoods MLRA (153A) consists of relatively flat coastal plain crossed by broad shallow valleys with meandering stream channels. The soils in this MLRA are commonly very deep, loamy or clayey soils that have a thermic temperature regimen, an aquic or udic moisture regime, and kaolinitic or siliceous mineralogy. About 54.2 miles (9 percent) of ACP pipeline facilities would be within MLRA 153A.

The Tidewater Area MLRA (153B) consists of nearly level coastal plain crossed by broad shallow valleys with meandering streams. The soils in this MLRA are commonly very deep, loamy to clayey soils that have a thermic temperature regime, an aquic moisture regime, and mixed or siliceous sand mineralogy. About 19.3 miles (3 percent) of ACP pipeline facilities would be within MLRA 153B.

4.2.2 Soil Characteristics and Limitations

We identified the types and characteristics of soils crossed by ACP and SHP using NRCS Soil Surveys and the computerized SSURGO database for each county affected by the projects. SSURGO provides the most detailed level of information of soil mapping done by the NRCS that is publicly available. The Web Soil Survey was also reviewed to provide interpretations of the sensitivity of soils to specific types of disturbance and soil suitability for specific types of uses such as roads and excavations.

As discussed below, the FS, as a land-managing agency, required Order 1 soil surveys on NFS lands crossed by the project. Order 1 Soil Surveys are intended to provide more site-specific soil data for the project and are considered supplements to the official soil survey, but they do not replace or change the "official" soil survey. Mapping at an Order 1 level or collecting point data may reveal inclusions within map units of soils that were not named in the official soil survey as well as use-dependent soil properties that are different from the typical soil properties listed for map units in the "official" soil survey (NRCS, 2016b). Based on information contained in the SSURGO database, ACP would cross about 1,077 individual soil map units consisting of one major soil type or complexes of two or more soil types that can contain a minor percentage (generally not more than 10 percent) of dissimilar soils. SHP would cross about 85 individual soil map units consisting of one major soil type or complexes. Our analyses focused on the major soil characteristics for the dominant soils within the map unit.

Several soil characteristics have the potential to affect, or be affected by, construction and operation of a pipeline. These include erosion potential, depth to shallow bedrock, stony and rocky soils, compaction potential, revegetation concerns, drainage patterns, hydric soils, and prime farmlands or farmlands of statewide importance. Soil chemistry, including soil carbon, would also be affected by the construction and operation of the pipeline. Soil chemistry can be substantially altered from the native soil condition as well as an expected increase in soil carbon losses due to the exposure, mixing, fertilization, loss of soils through erosion, and change in vegetation where originally forested on the permanent right-of-way. These soil characteristics are further described in the sections below. Table 4.2.2-1 summarizes the soil characteristics (in acres) that would be impacted by construction and operation of ACP and SHP. Construction impacts and mitigation measures are discussed further in section 4.2.3.

NFS Lands

In addition to utilizing the SSURGO databases, the FS required Order 1 Soil Surveys for the portion of ACP on NFS lands, including the MNF and the GWNF. The Order 1 Soil Survey was completed by Atlantic to meet MNF LRMP SW02 (additional discussion of the FS' LRMP standards is provided in section 4.8.9). The MNF LRMP SW02 is a FS goal to collect, interpret, and display soils information on MNF lands to:

1. determine the kinds and intensities of soil resource inventories needed;
2. identify relationships between soil types and the growth of trees or other vegetation;
3. predict effects to soil and water resources caused by various management options applied to specific tracts of land;
4. provide information to aid in multiple-use management that does not impair the productivity of the land; and

5. identify limitations on management practices and mitigation measures by soil mapping unit for activities that have the potential to impact soil and water resources.

As a result of the MNF LRMP SW02 and SW10, which provide guidelines to inventory the soil resource to the appropriate intensity level as needed for project planning and/or design considerations, the FS selected an Order 1 Soil Survey methodology which is based on a more precise degree of study, and therefore a more detailed level of information than SSURGO databases. Atlantic's and the FS' agreed-upon Order 1 Soil Survey Protocols stated that the site-specific data obtained from the Order 1 Soil Survey would be used to update the Soil Resource Section for the final EIS on NFS lands, and to make more informed decisions related to design, construction, restoration, and maintenance of the proposed pipeline, right-of-way, and other project components.

The Order 1 Soil Survey activities were conducted in a manner compliant with the requirements outlined in special use permit #GBR205003, dated April 22, 2015, for surveys in the MNF, and SUP #GWP433201T, dated March 31, 2015, for surveys in the GWNF, both of which were issued by the FS. These two permits were renewed as #MAR205001 dated April 11, 2016, and #GWP433202T dated April 11, 2016, as well as amendment #1 to SUP GWP433202T dated May 20, 2016. The results of the survey are summarized in a report that Atlantic provided to the FS on August 1, 2016, and filed on the FERC docket.[8] Overall, both types of soil surveys are used to inform the effects analysis, planning, design, and construction for this project.

4.2.2.1 Erosion by Water and Wind

Erosion is a natural process generally resulting from water and wind forces that can be accelerated by human disturbance. Factors that influence the magnitude of erosion include soil texture, soil structure, length, and percent of slope, existing vegetative cover, rainfall intensity, and wind intensity.

Soils most susceptible to water erosion are typified by bare or sparse vegetative cover, non-cohesive soil particles, low infiltration rates, and/or moderate to steep slopes. Soils more typically resistant to water erosion include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. The potential for soils to be eroded by water was evaluated based on the K factor, where available, and slope. The K factor represents a relative quantitative index of the susceptibility of bare soil to particle detachment and transport by water, and is one of the factors used in the Revised Universal Soil Loss Equation to calculate soil loss. K factor values range from 0.02 to 0.69. Soils with a slope greater than 15 percent or soils with a K value of greater than 0.35 and slopes greater than 5 percent are considered highly erodible by water.

Susceptibility to wind erosion is less affected by slope angles and is more directly influenced by physical soil factors including moisture, texture, calcium carbonate content, and organic matter; and landform and landscape conditions including soil roughness factors, unsheltered distance, and vegetative cover. Wind Erodibility Groups (WEGs) are a direct indicator of the inherent susceptibility of soils to wind erosion. WEGs may range from 1 to 8, with 1 being the highest potential for wind erosion, and 8 the lowest (NRCS, 2016a). Soils with WEGs of 2 or less are considered highly erodible due to wind.

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[8] The soil report can be found under FERC Accession No. 20160802-5107 at the following website location (under the Files, there are nine parts to the public soils report): https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20160802-5107.

Based on the K factor and slope designations discussed above, 4,337.4 acres of soils susceptible to water erosion would be affected by constructing the projects, including 3,653.3 acres for ACP and 684.1 acres for SHP.

Based on the WEG designations discussed above, 1,321.7 acres of soils susceptible to wind erosion would be affected by constructing ACP; no soils susceptible to wind erosion would be affected by SHP.

NFS Lands

Based on the Order 1 Soil Survey, the predominant soil textures observed in the field through the NFS lands were silt loams and occurred on abundant steep slopes. The ridgelines and steep backslopes were mostly comprised of soil material with this silt-rich texture. The silt particle size (2-50 µm) is the most susceptible to erosion due to its light weight and minimal cohesiveness. Erosion and sediment control measures would be critical during and post construction with soil material that is highly susceptible to erosion, especially on steep slopes.

4.2.2.2 Hydric Soils

A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (NRCS, 2016a). These soils are typically indicative of areas with a high mean water table and wetlands. However, agricultural lands can contain hydric soils that are no longer saturated due to managed hydrology practices (e.g., drain tiling or ditching) for crop development. Additionally, seasonal and climatic precipitation factors can influence water tables and soil saturation and result in soil phases where soil characteristic do not resemble hydric soils. Hydric soils are one indicator used to field delineate wetland boundaries in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (USACE, 1987). The interaction of hydrology, vegetation, and soil results in the development of characteristics unique to wetlands, which are further discussed in section 4.3.3, as the wetland delineations would locate areas of hydric soils.

Based on SSURGO data, 1,642.8 acres of soils that would be affected by constructing the projects are classified as hydric soils, including 1,641.3 acres for ACP and 1.5 acres for SHP.

NFS Lands

According to the Order 1 Soil Survey, the ACP project route in NFS lands favors ridgelines. Thus, 87 percent of the soil test pit observations were well drained to excessively drained. Only one soil profile was described as poorly drained, and less than 5 percent were classified as somewhat poorly drained.

TABLE 4.2.2-1

Summary of Soil Characteristics Affected by the Atlantic Coast Pipeline and Supply Header Project (in acres) [a, b]

	Highly Water Erodible [c]		Highly Wind Erodible [d]		Hydric [e]		Compaction Prone [f]		Stony/Rocky [g]		Shallow to Bedrock [h]		Poor Revegetation Potential [i]		Prime Farmland [j]		Farmland of Statewide Importance [k]	
Project	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]
ATLANTIC COAST PIPELINE																		
West Virginia																		
Pipeline Right-of-Way [m]	1,135.3	--	4.2	--	8.0	--	23.4	--	451.9	--	1,306.7	--	1,436.9	--	55.1	--	348.1	--
Aboveground Facilities [n]	51.3	34.9	--	--	--	--	--	--	2.4	2.4	58.7	38.9	65.3	43.3	--	--	43.7	27.5
Access Roads	327.2	317.6	1.9	1.9	2.9	2.9	4.4	3.8	149.8	149.2	270.5	267.9	373.2	363.7	7.7	7.1	62.1	57.4
Pipe/Contractor Yards	23.9	--	--	--	100.8	--	165.4	--	29.5	--	23.7	--	202.2	--	111.8	--	134.3	--
WV Subtotal	1,537.7	352.6	6.1	1.9	111.7	2.9	193.2	3.8	633.6	151.6	1,659.5	306.8	2,077.7	407.0	174.6	7.1	588.3	84.9
Virginia																		
Pipeline Right-of-Way [m]	1,728.3	--	284.9	--	470.3	--	108.2	--	1,007.0	--	1,068.7	--	3,148.4	--	1,475.5	--	1,160.8	--
Aboveground Facilities [n]	20.6	6.1	25.0	6.6	0.4	0.4	--	--	0.9	0.9	9.0	1.2	17.1	4.8	40.1	15.1	8.8	0.9
Access Roads	175.7	168.5	18.7	16.8	24.2	12.5	3.4	3.3	135.8	133.4	113.4	112.6	259.0	237.6	115.4	89.2	53.9	48.8
Pipe/Contractor Yards	151.3	--	2.1	--	72.4	--	56.6	--	44.4	--	0.3	--	135.5	--	166.3	--	92.2	--
VA Subtotal	2,075.9	174.5	330.6	23.4	567.2	12.9	168.3	3.3	1,188.1	134.2	1,191.4	113.8	3,560.0	242.4	1,797.4	104.3	1,315.6	49.6
North Carolina																		
Pipeline Right-of-Way [m]	39.3	--	931.0	--	911.1	--	71.2	--	--	--	19.6	--	1,234.4	--	1,740.5	--	595.0	--
Aboveground Facilities [n]	--	--	6.8	3.3	8.2	8.2	--	--	--	--	--	--	29.7	24.1	41.5	30.9	13.0	9.5
Access Roads	0.4	0.4	34.3	30.2	20.4	11.7	0.9	0.8	--	--	--	--	37.5	25.4	65.6	51.9	20.1	16.0
Pipe/Contractor Yards	--	--	13.0	--	22.8	--	--	--	--	--	--	--	27.9	--	118.6	--	3.7	--
NC Subtotal	39.7	0.4	985.0	33.5	962.4	20.0	72.1	0.8	-	-	19.6	-	1,329.5	49.5	1,966.2	82.8	631.8	25.5
ACP Total	**3,653.3**	**527.5**	**1,321.7**	**58.8**	**1,641.3**	**35.7**	**433.5**	**7.9**	**1,821.7**	**285.8**	**2,870.5**	**420.6**	**6,967.3**	**698.9**	**3,938.2**	**194.2**	**2,535.8**	**160.0**
SUPPLY HEADER PIPELINE																		
West Virginia																		
Pipeline Right-of-Way [m]	435.4	--	--	--	--	--	--	--	38.6	--	426.8	--	434.1	--	25.2	--	110.9	--
Aboveground Facilities [n]	63.5	9.9	--	--	--	--	--	--	11.4	--	65.3	10.6	65.9	11.2	--	--	41.8	8.1
Access Roads	86.7	86.7	--	--	--	--	--	--	17.3	17.3	78.7	78.7	80.5	80.5	10.1	10.1	28.9	28.9
Pipe/Contractor Yards	14.5	--	--	--	--	--	--	--	--	--	18.8	--	18.8	--	5.5	--	15.8	--
WV Subtotal	600.2	96.7	--	--	--	--	--	--	67.4	17.3	589.7	89.3	599.3	91.7	40.9	10.1	197.4	36.9
Pennsylvania																		
Pipeline Right-of-Way [m]	26.9	--	--	--	1.5	--	1.5	--	25.6	--	26.8	--	36.6	--	14.7	--	23.5	--
Aboveground Facilities [n]	21.3	3.2	--	--	--	--	--	--	11.6	2.6	1.6	1.2	21.3	3.2	6.1	0.5	16.7	2.6

TABLE 4.2.2-1 (cont'd)

Summary of Soil Characteristics Affected by the Atlantic Coast Pipeline and Supply Header Project (in acres) [a, b]

	Highly Water Erodible [c]		Highly Wind Erodible [d]		Hydric [e]		Compaction Prone [f]		Stony/Rocky [g]		Shallow to Bedrock [h]		Poor Revegetation Potential [i]		Prime Farmland [j]		Farmland of Statewide Importance [k]	
Project	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]	Const.	Op. [l]
Access Roads	8.0	8.0	--	--	--	--	0.3	0.3	3.5	3.5	6.1	6.1	8.3	8.3	3.5	3.5	6.3	6.3
Pipe/Contractor Yards	27.8	--	--	--	--	--	--	--	22.3	--	21.1	--	37.7	--	2.6	--	23.2	--
PA Subtotal	84.0	11.2	--	--	1.5	--	1.7	0.3	63.0	6.1	55.6	7.3	103.9	11.5	26.9	4.0	69.8	8.9
SHP Total	**684.1**	**107.9**	--	--	**1.5**	--	**1.7**	**0.3**	**130.4**	**23.4**	**645.3**	**96.6**	**703.2**	**103.2**	**67.8**	**14.1**	**267.2**	**45.8**
ACP and SHP Total	**4,337.4**	**635.4**	**1,321.7**	**58.8**	**1,642.8**	**35.7**	**435.2**	**8.2**	**1,952.1**	**309.2**	**3,515.8**	**517.2**	**7,670.5**	**802.0**	**4,006.0**	**208.3**	**2,802.9**	**205.9**

[a] Soil may have more than one characteristic.

[b] Data from SSURGO Databases.

[c] Includes soils with a slope greater than 15 percent or soils with a K value of greater than 0.35 and slopes greater than 5 percent.

[d] Includes soils in wind erodibility group designation of 1 or 2.

[e] Includes soils that are classified as hydric by SSURGO.

[f] Includes soils in somewhat poor to very poor drainage classes with surface textures of clay loam and finer.

[g] Includes soils with a cobbley, stony, bouldery, shaly, very gravelly, or extremely gravelly modifier to the textural class of the surface layer and/or that have a surface layer that contains greater than 5 percent by weight rock fragments larger than 3 inches.

[h] Includes soils identified with bedrock at a depth of 5 feet or less from the surface.

[i] Includes soils with a non-irrigated land capability classification of 3 or greater.

[j] Includes soils that meet the prime farmland or prime farmland if a limiting factor is mitigated.

[k] Includes soils classified as farmland of statewide importance by SSURGO.

[l] Construction-related impacts on soils in the pipeline right-of-way would be temporary and localized to the construction workspace and would be minimized by the construction and restoration plans summarized above and discussed throughout this EIS. Therefore, operational impacts to soils within the pipeline right-of-way are not presented in this table.

[m] Includes the temporary construction workspaces, additional temporary workspaces, and permanent pipeline easements; operations calculations for the AP-1 permanent right-of-way are based on a 75-foot-wide permanent right-of-way on non-NFS lands, and a 53.5-foot-wide long-term right-of-way on NFS lands. However, the FS has stated the operational right-of-way on NFS lands would be 50 feet wide. As such, final operational impacts should be less than those provided. However, current numbers do not account for the extra 25 feet of workspace width that ACP has requested for implementing topsoil segregation at locations on NFS land where such segregation is feasible.

[n] Includes mainline valves, meter and regulating stations, and launcher/receiver facilities not contained within the pipeline construction workspaces or permanent pipeline easement.

Note: Sum of addends may not equal total due to rounding.

4.2.2.3 Compaction-prone Soils

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Compaction occurs when soil is subjected to heavy loads or traffic. Similarly, rutting is caused by the plastic deformation of soil when subject to an external load. The degree of compaction depends on moisture content, soil textures, and rock fragment content. Soils classified as having somewhat poor to very poor drainage classes and surface textures of clay loam and finer are considered to have a high potential for compaction. Surface texture characteristics were used as an indicator of overall soil compaction potential; however, as outlined in the FERC *Plan*, during the restoration phase of construction compaction of topsoil and subsoil layers would be tested at regular intervals in agricultural and residential areas using penetrometers or other appropriate equipment. Testing would also occur on impacted soil types in adjacent, undisturbed areas to approximate preconstruction conditions and inform where soil compaction mitigation would be required.

Based on SSURGO data, 435.2 acres of soils that would be affected by constructing the projects have a high potential for compaction, including 433.5 acres for ACP and 1.7 acres for SHP.

NFS Lands

The Order 1 Soil Survey revealed that the predominant soil texture observed in the field was silt loam. However, the laboratory data revealed a wider variety of textures from sandy loam to clay loam and even clay. In both the MNF and GWNF, the family particle-size classes are concentrated in three classes: coarse-loamy, fine-loamy, and loamy-skeletal, with just a few pits containing soils that fall into the fine class. Drainage classes of the soils observed in the project area were predominantly well drained to excessively drained. In the MNF, 89 percent of the soil observations revealed well drained or somewhat excessively drained conditions, while the remainder were moderately well drained or somewhat poorly drained. In the GWNF, 86 percent of soil observations revealed well drained to excessively drained soils, while the remainder were moderately well drained to poorly drained. Based on this analysis, most of soils in NFS lands (MNF and GWNF) would have a low to moderate potential for compaction. However, in those specific areas where the combination of a finer textured soil (clay loam or finer) and somewhat poor to poor drainage classes, soils would have a high potential for compaction.

The FS and Atlantic are currently working on prescribed measures to be used on NFS Lands for mitigating compaction and reducing the potential for compaction; these measures will be included in the *COM Plan*.

4.2.2.4 Shallow Depth to Bedrock and Rocky Soils

Construction in soils with shallow bedrock increases the potential to introduce stones and other rock fragments to surface soil layers which may reduce soil moisture-holding capacity, resulting in a reduction of soil productivity. Additionally, some agricultural equipment may be damaged by contact with large rocks and stones. Rock fragments at the surface and in the surface layer may be encountered during grading, trenching, and backfilling. Construction through soils with shallow bedrock could result in the incorporation of bedrock fragments into surface soils.

Soils with textural classifications including stony, cobbly, gravelly, shale, slate, and droughty in any layer, or with stones larger than 3 inches in the surface layer in greater than 15 percent of the area, could be characterized as stony or rocky soil. Typically, stony-rocky soils do not hold water well and exhibit a low revegetation potential due to low water content and high seed mortality.

Shallow bedrock, where the depth to paralithic to lithic bedrock is less than 5 feet below the ground surface, and therefore within the anticipated pipeline trench depth, is prevalent, and special construction techniques such as ripping, sawing, hammering, or blasting of the bedrock may be required. Note that the definition of shallow-to-bedrock soils is different than the NRCS' definition of a "shallow soil," which includes soils with bedrock within 20 inches of the soil surface. However, shallow soils are included in the definition of shallow-to-bedrock soils used in this analysis.

Based on the available SSURGO data and the factors discussed above, 3,515.8 acres of soils with shallow depth to bedrock would be affected by constructing the projects, including 2,870.5 acres for ACP and 645.3 acres for SHP. Additionally, constructing the projects would impact 1,952.1 acres of stony or rocky soils, including 1,821.7 acres for ACP and 130.4 acres for SHP.

NFS Lands

The Order 1 Soil Survey revealed that 73 percent of soil observations in the MNF had bedrock as a restrictive layer type and 68 percent of soil observations in the GWNF had bedrock as a restrictive layer type. The survey did not identify paralithic layers as restrictive. More than half (53 percent) of the observations in the MNF had the depth to the restrictive layer (includes a few observations of fragipans) as less than 36 inches with a few as shallow as 12 inches (or less). In the GWNF 63 percent of the observations had depth to restrictive layer (includes a few observations of fragipans) as less than 36 inches, with a few as shallow as 12 inches (or less).

During the Order 1 Soil Survey, additional bedrock depth measurements were to be recorded and used to inform the *Blasting Plan*. However, in test pits dug for the Order 1 Soil Survey, 124 out of 360 did not encounter bedrock within the excavated depth. As a result, the FS and Atlantic determined that seismic refraction surveying would be conducted on the 124 test pits that did not reach bedrock, and the data would be used to update the *Blasting Plan* and provide indication along the route where blasting would be required.

Draper Aden Associates was retained by Atlantic to conduct the seismic refraction study for the ACP route on NFS lands. The seismic study by Draper Aden Associates made a distinction between paralithic (weathered rock) surfaces and lithic (unweathered rock) surfaces based on the p-wave velocity (2,000 feet per second for weathered rock surfaces and 3,500 feet per second for unweathered rock surfaces). The seismic study produced maps with detailed cross sections that showed the depth to weathered rock and to unweathered rock.

Based on the results from the seismic refraction survey, on NFS lands depth to weathered rock ranges from 0 feet to 19 feet due to the various lithologies present across the route. Depth to rock ranges from 7.3 feet to 46.9 feet. Based on the definition of shallow bedrock (depth to bedrock is less than 5 feet below the ground surface, and therefore within the anticipated trench depth), 5 out of the 124 remaining Order 1 Soil Survey pits without depth to bedrock are classified as having shallow bedrock. The remaining 96 percent of the 124 Order 1 Soil Survey Pits have bedrock that is greater than 5 feet deep. The results from the seismic refraction survey indicate that soils along the proposed ACP route are much deeper than what the Order 1 Soil Survey data interprets.

4.2.2.5 Poor Revegetation Potential

Multiple factors contribute to the potential of soil to support vegetation. Some factors include topsoil thickness, soil texture, available water capacity, susceptibility to flooding, soil chemistry, soil microbial populations, organic matter content, and slope. Other considerations include whether the soils are natural, human transported, or disturbed. Some soils have characteristics that cause a high seed mortality. These areas may need additional management and may be difficult to revegetate. The clearing and grading of soils with poor revegetation potential could result in decreased revegetation success following construction and restoration of the right-of-way, which could lead to increased erosion, a reduction in wildlife habitat, and adverse visual impacts.

The land capability classification is a system of grouping soils primarily based on their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time (NRCS, 2016a). The capability class ranges from 1 to 8, with 1 having the fewest limitations and 8 having very severe limitations that restrict their use for crops and pasture plants. Soils with a non-irrigated land capability classification of 3 or greater are characterized as having poor revegetation potential.

Based on the factors discussed above, 7,670.5 acres of soils with poor revegetation potential would be affected by constructing the projects, including 6,967.3 acres for ACP and 703.2 acres for SHP.

NFS Lands

The Order 1 Soil Survey revealed that, in general, nutrient contents and pH in the sampled soils were below optimum levels for supporting grass and forbs, primarily a result of the acidic and nutrient-poor geology. Soils tended to be acidic with a pH ranging from 3.1 to 6.7. The lowest and highest pH values were observed in O horizons. These below optimum levels pose a challenge for restoration, as the native species growing in this environment are adapted to the low pH and nutrient levels; some species prefer to grow in mildly acidic soils. For an accelerated reestablishment of vegetation for erosion control and stabilization of the disturbed landscapes, soils should be fertilized, limed, and receive organic and biologic amendments. The FS would use nutrient values from the Order 1 Soil Survey, in consultation with Atlantic, to help determine the rate of fertilizer and lime application. Performance-based measures would be used to identify whether revegetation is successful.

4.2.2.6 Prime Farmland

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pasture, woodland, or other lands). Urbanized land and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The NRCS also recognizes farmlands of statewide importance, which are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives, fruits, and vegetables). Farmlands of statewide importance have the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture. The methods for defining and listing farmland of statewide importance are determined by the appropriate state agencies, typically in association with local soil conservation districts or other local agencies.

The projects would impact 4,006.0 acres of prime farmland, including 3,938.2 acres for ACP and 67.8 acres for SHP. In addition, the projects would impact 2,802.9 acres of farmland of statewide importance, including 2,535.8 acres for ACP and 267.2 acres for SHP. Construction of aboveground facilities and permanent access roads would permanently impact 208.3 acres of prime farmland and 205.9 acres of farmland of statewide importance. Those areas of prime farmland or farmland of statewide importance that are temporarily impacted and currently in agriculture could return to that use after construction.

4.2.2.7 Topsoil

Topsoil is the uppermost layer of soil and typically has the highest concentration of organic materials with generally greater biological productivity than subsurface soils. Microorganisms and other biological material found in topsoil, in addition to inorganic soil components, provide the bulk of the necessary nutrients to vegetation. Topsoil also has the highest concentration of plant roots and seeds. Topsoil preservation is important especially for restoration of natural vegetation and cropland as well as range or pasture lands, especially in areas where topsoil is limited in extent or depth. Topsoil preservation in forested areas is also important for restoration of natural vegetation and of the physical, chemical, and biological properties of the soil. Topsoil, including organic horizons, maintain hydrologic and nutrient cycles, both of which are key factors for successful revegetation, restoring natural hydrologic functions to support land stability, and reducing erosion. Topsoil thickness is the result of factors such as wetness, topography, climate, and the predominant vegetation present when the soil was being formed.

The projects would impact approximately 9,047.0 acres (76.9 percent) of soils that have topsoil depths greater than 12 inches, while 1,313.8 acres (11.1 percent) of the soils crossed have topsoil depths less than 6 inches (see table 4.2.2-2). Topsoil depths for 133.4 acres of soils crossed were not rated in the SSURGO database.

NFS Lands

Using the Order 1 Soil Survey information, on NFS Lands approximately 117.4 acres (15 percent) of soils have topsoil depths greater than or equal to 6 inches, while 654.3 acres (85 percent) of the soils crossed have topsoil depths less than 6 inches (see table 4.2.2-2). Atlantic has agreed to segregate 6 inches of topsoil material over the trench area in specific locations, totaling 2.4 miles of the route within NFS lands (11.4 percent of NFS lands). Atlantic has also agreed to apply an organic soil amendment, ProGanics™ Biotic Soil Media™, and an erosion control material, Flexterra® High Performance-Flexible Growth Medium™, to all areas of disturbance along the route on NFS lands. Atlantic and the FS are finalizing topsoil segregation protocols and mitigations for NFS lands, which will be included in the *COM Plan.*

4.2.2.8 Slope

The slope gradient of a soil influences several characteristics such as the ability of a soil to retain water and the potential for accelerated erosion or subsidence (NRCS, 2016a). The slope gradient of a soil is used to assess soils with high water erosion potential and is a factor used to identify soils that may have revegetation concerns. It is important to establish vegetation cover and reduce the time and amount of bare soil that is exposed to rain and runoff impacts.

Based on the available SSURGO data, the projects would impact approximately 5,143.5 acres (43.7 percent) of soils that have a representative slope class greater than 8 percent, while 6,524.9 acres (55.4 percent) of the soils crossed have a representative slope class less than 8 percent (see table 4.2.2-2). Slope classification for 100.7 acres of soils crossed was not rated in the SSURGO database. Additional information on slopes and slope classes can be found in section 4.1.4.2.

TABLE 4.2.2-2

Summary of Topsoil Depths and Slope Classes within the Atlantic Coast Pipeline and Supply Header Project Area (in acres)

Project, State or Commonwealth, Component	Topsoil Depth (inches) [a]					Slope Class (percent) [b]					
	0-6 inches	>6-12 inches	>12-18 inches	>18 inches	Not Rated [a]	0-5	>5-8	>8-15	>15-30	>30	Not Rated [b]
ATLANTIC COAST PIPELINE											
West Virginia											
Pipeline Right-of-Way [c]	560.2	127.6	408.3	456.1	52.6	77.6	62.6	331.7	638.5	441.5	52.9
Aboveground Facilities [d]	15.4	3.3	52.5	3.3	--	9.7	--	16.8	31.5	16.4	--
Access Roads	122.0	25.6	80.9	169.2	23.9	23.9	6.2	60.1	165.5	141.3	24.6
Pipe/Contractor Yards	58.3	75.5	11.1	179.4	14.6	262.0	37.6	21.1	7.6	7.9	2.7
WV Subtotal	756.0	231.9	552.9	808.0	91.0	373.2	106.3	429.7	843.1	607.3	80.1
Virginia											
Pipeline Right-of-Way [c]	262.3	497.1	1,537.4	2,359.7	26.3	2,379.3	41.3	1,065.3	751.8	434.5	10.6
Aboveground Facilities [d]	0.9	12.9	8.2	34.7	--	46.4	--	10.3	--	--	--
Access Roads	58.0	44.9	141.4	129.7	2.0	161.2	2.0	72.9	71.4	68.1	0.6
Pipe/Contractor Yards	1.4	4.0	122.3	261.6	2.2	352.1	--	35.6	0.8	0.8	2.2
VA Subtotal	322.6	558.8	1,809.4	2,785.6	30.6	2,939.0	43.2	1,184.1	824.0	503.3	13.5
North Carolina											
Pipeline Right-of-Way [c]	6.0	121.2	830.6	1,774.8	1.2	2,623.5	53.6	39.3	14.8	1.4	1.2
Aboveground Facilities [d]	--	5.2	2.4	52.0	--	57.1	--	2.5	--	--	--
Access Roads	0.5	9.2	32.4	57.6	0.2	96.4	1.9	1.0	0.4	--	0.2
Pipe/Contractor Yards	--	--	55.1	72.3	--	127.4	--	--	--	--	--
NC Subtotal	6.5	135.6	920.5	1,956.7	1.4	2,904.4	55.4	42.8	15.3	1.4	1.4
ACP Total	**1,085.1**	**926.3**	**3,282.8**	**5,550.3**	**124.7**	**6,216.6**	**205.0**	**1,656.6**	**1,682.3**	**1,111.9**	**95.0**
SUPPLY HEADER PROJECT											
West Virginia											
Pipeline Right-of-Way [c]	131.3	292.0	21.0	18.9	1.5	28.4	5.0	3.7	265.0	162.6	--
Aboveground Facilities [d]	57.9	--	1.1	12.0	--	5.7	--	1.8	36.4	27.1	--
Access Roads	22.8	56.0	10.0	12.3	1.0	14.4	6.8	1.9	33.8	45.0	0.2
Pipe/Contractor Yards	10.7	0.7	8.9	4.1	5.5	5.1	0.4	12.3	3.5	3.0	5.5
WV Subtotal	222.7	348.6	41.0	47.4	8.0	53.6	12.3	19.6	338.7	237.7	5.7
Pennsylvania											
Pipeline Right-of-Way [c]	4.9	--	1.0	47.9	--	8.0	10.7	21.1	4.8	9.2	--
Aboveground Facilities [d]	1.0	--	2.6	23.8	--	6.1	--	16.7	3.6	1.0	--

TABLE 4.2.2-2 (cont'd)

Summary of Topsoil Depths and Slope Classes within the Atlantic Coast Pipeline and Supply Header Project Area (in acres)

Project, State or Commonwealth, Component	Topsoil Depth (inches) [a]					Slope Class (percent) [b]					
	0-6 inches	>6-12 inches	>12-18 inches	>18 inches	Not Rated [a]	0-5	>5-8	>8-15	>15-30	>30	Not Rated [b]
Access Roads	0.1	--	0.6	10.8	0.7	2.8	1.6	6.5	0.7	0.5	--
Pipe/Contractor Yards	--	--	9.3	29.6	1.6	2.6	5.6	19.2	12.8	0.3	--
PA Subtotal	6.0	0.0	13.4	112.1	2.3	19.5	17.8	63.6	21.9	11.0	0.0
SHP Total	**228.7**	**348.6**	**54.4**	**159.5**	**10.3**	**73.1**	**30.1**	**83.2**	**360.7**	**248.7**	**5.7**
ACP and SHP Total	**1,313.8**	**1,274.9**	**3,337.2**	**5,709.8**	**135.0**	**6,289.8**	**235.2**	**1,739.8**	**2,043.0**	**1,360.7**	**100.7**

[a] Topsoil depths were calculated using the depth of the uppermost soil horizon of the dominant soil within each map unit as outlined in the SSURGO databases. Not all soil map units in the SSURGO databases have been designated a depth to the upper and lower boundaries of each soil horizon; in these cases, soils were classified as "Not Rated."

[b] Slope classes were assigned using the representative slope value of the dominant soil within each map unit as outlined in the SSURGO databases. Not all soil map units in the SSURGO databases have been designated a representative slope value; in these cases, soils were classified as "Not Rated."

[c] Includes the temporary construction workspaces, additional temporary workspaces, and permanent pipeline easements.

[d] Includes mainline valves, meter and regulating stations, and launcher/receiver facilities not contained within the pipeline construction workspaces or permanent pipeline easement.

Note: Sum of addends may not equal total due to rounding.

As discussed in section 4.1.4.2, Atlantic and DETI would implement a comprehensive Geohazards Analysis Program to assess potential geohazards, including slope failures, along the proposed pipeline routes and at aboveground facility sites. Additionally, Atlantic and DETI are developing a BIC Team to incorporate the results of the Geohazard Analysis Program into the project design and engineering and to address issues of landslide potential and susceptibility. Field reconnaissance and workshops are underway with subject matter experts to further identify, assess, and mitigate slope instability hazards. The BIC Team is considering, but has not currently adopted, specific screening criteria for slopes that would be identified for site-specific requirements for construction and restoration. Additionally, Atlantic and DETI would implement the measures in its SAIPR to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction. See section 4.1.4.2 for additional information on slope stability, landslides and steep slopes. Steep terrain and the BIC Program are further discussed in section 8.7.2 of the *COM Plan*.

NFS Lands

According to the Order 1 Soil Survey, slopes observed along the project route were fairly steep, with 32 percent of the soil test pits (113) located on slopes ranging from 45 to 70 percent. Some slopes were as steep as 100 percent. Slopes were measured with inclinometers or Abney levels to assign slope classes for mapping units. Seven slope classes were designated for the survey, although combinations of classes were used for complex slopes that rapidly changed over short distances.

4.2.2.9 Contaminated Soils

Atlantic and DETI conducted a database search to identify locations with potential and/or actual sources of contamination that may be impacted by construction of the projects. None of the known sites would be crossed by the pipeline centerline and would not be directly affected by trenching. Sites up and/or side gradient of the project could result in runoff into the project trench and workspace areas. Additional discussion of contaminated sites and the *Contaminated Media Plan* can be found in section 4.8.7.

If suspected contaminated soil or groundwater is encountered during the construction, Atlantic and DETI would implement its *Contaminated Media Plan*, which we have reviewed and find acceptable. Measures to identify and mitigate encountered contaminated soils include:

- training of contractor personnel and environmental inspectors to identify potential contamination;
- stopping excavation in the area of potential contamination and immediately contacting an EI or Atlantic/DETI representative;
- placing potentially contaminated soils on and covering with an impervious surface to prevent rainfall run-on and run-off;
- implementing measures to ensure rainwater does not enter the trench and restricting trench dewatering activities;
- testing the media to determine contamination type and concentrations, if found;
- notifying the appropriate federal, state/commonwealth, and local agencies of the contamination; and
- disposing of contaminated soil at an approved disposal facility, when necessary.

4.2.2.10 Ground Heaving

Ground heaving is the uplifting of soil, typically based on the development and growth of ice lenses underneath the upper soil layer. Ground heaving or frost heaving is based on soil saturation, soil characteristics, and freezing temperatures. The maximum depth of frost penetration within the area of the projects does not exceed 2.5 feet in most years (NOAA, 1978). The trench would be excavated to a depth that would provide sufficient cover over the pipeline in accordance with DOT standards in 49 CFR 192.327 (see section 4.12.1 for detailed depth of cover requirements). Typically, the trench would be deep enough (about 8 feet deep for the 42- and 36-inch-diameter ACP mainlines, about 7 feet for the 30-inch-diameter SHP looplines, and 6 feet deep for the 20- and 16-inch-diameter ACP laterals) to provide a minimum of 3 feet of cover over the top of the pipe after backfilling. Therefore, the likelihood of frost affecting soils surrounding the buried pipeline is low. Additionally, the ground surrounding the buried pipeline would be warmed by natural gas flow in the winter. Based on these circumstances the risk of ground heaving and associated potential impacts on or from a pipeline, from freeze-thaw action is low.

4.2.3 General Impacts and Mitigation

This section describes general soil impacts and mitigation measures that would be implemented along ACP and SHP routes. Additional measures that would be implemented on federal lands and in accordance with applicable LMRPs are discussed further in section 4.2.7. Construction activities, such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way would affect soil resources. Clearing removes protective vegetative cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential and sedimentation into streams. Construction activities would affect soil fertility and revegetation potential, and could facilitate the dispersal and establishment of weeds. Inadequate restoration of subsoil and topsoil during trench backfilling, grading, and restoration could result in poor revegetation, decreased soil stabilization, increased erosion and sedimentation, and settling over the buried pipeline. In addition, contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils. Excess rock or fill material brought to the surface during trenching operations could hinder the restoration of the right-of-way. In areas of forest where the vegetation would change on the permanent right-of-way after construction, the continued formation and weathering of soil would continue over the life of the project. In other areas of cropland, pasture, residential developments, or other open areas, the right-of-way would revert to its former use after construction. Mitigation and design features would be applied to soil-disturbing activities to reduce these effects. The degree to which mitigation and design features would be applied will be based on performance and effectiveness of these measures during project implementation and restoration.

In general, Atlantic and DETI would reduce soil impacts by limiting the area of disturbance to the areas needed for safe construction of the proposed facilities; collocating the workspace with previously disturbed areas where possible; initiating restoration as soon as reasonably possible after final grading; and utilizing existing roads for temporary and permanent access to the extent possible. Atlantic and DETI would further minimize impacts on soil resources by constructing and operating the projects in accordance with their construction and restoration plans identified in table 2.3.1-1 and discussed throughout the EIS. The general measures applicable to soils management include, but are not limited to:

- Removing topsoil from either the full work area or from the trench and subsoil storage area in cultivated or rotated cropland and managed pastures; residential area; hayfields; or other areas at the landowner or land managing agency's request. At least 12 inches of topsoil would be removed in areas of deep topsoil and every effort would be made to segregate the entire topsoil layer in soils with less than 12 inches of topsoil. Topsoil piles would be segregated from subsoil throughout construction and would be stabilized with sediment barriers, mulch, temporary seeding, tackifiers, and functional equivalents, where necessary.

- Installing temporary erosion control devices within the trench and workspace immediately after initial disturbance of the soil and maintaining the devices throughout construction until replacement by permanent controls or completion of restoration. Temporary and permanent controls may include slope breakers, trench plugs, sediment barriers, and mulch. Slope breakers would break the slope length and direct runoff from the disturbed right-of-way to reduce erosion. Trench plugs would prevent water from flowing along the pipeline and key the pipeline into the adjacent undisturbed soil and rock to provide stability to the pipeline and slope.

- Implementing measures to reduce wind erosion and control dust such as applying water to work areas, reducing vehicle speeds on unpaved surfaces, covering haul trucks in transit, and using gravel at paved road access points as needed.

- Managing fuel and other hazardous materials in accordance with applicable regulations designed to prevent inadvertent spills, and implementing specific measures to limit and cleanup any spills that occur as well as manage pre-existing soil contamination, if encountered.

- Conducting trench dewatering in a manner that does not cause erosion and in accordance with state and federal permit requirements, where applicable.

- Segregating the top 12 inches of topsoil from the area of the trench in wetlands, except where standing water is present or soils are saturated.

- Using low-ground-weight equipment in areas of standing water or saturated soils in wetlands, or using timber riprap or similar supports to support construction equipment in wetlands or other areas prone to compaction or rutting.

- Testing topsoil and subsoil for compaction at regular intervals in agricultural and residential areas. Severely compacted soils in agricultural areas would be plowed with a paraplow or other deep tillage equipment. The subsoil would be plowed in areas where topsoil has been segregated prior to topsoil replacement. Appropriate soil compaction mitigation would also be conducted in severely compacted residential areas.

- Controlling rock generated during blasting operations. Where necessary, excess rock would be hauled off to an approved disposal location or used as beneficial reuse, per landowner or land management agency approval and as required by permit requirements.

- Using excavated rock to backfill the trench only to the top of the existing bedrock profile. Excess rock would be considered construction debris unless approved for use on the right-of-way by the landowner or managing agency. Excess rock would also be removed from the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, residential areas, and other areas at landowner request. The size, density, and distribution of rock within the restored right-of-way would be similar to adjacent areas.

- Seeding disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency, except in cultivated croplands unless requested by the landowner. Disturbed soils would be seeded within 6 working days of final grading, weather and soil conditions permitting, in the absence of written recommendations from the local soil conservation authorities.

- Fertilizing and adding soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. The recommended soil pH modifier and fertilizer would be incorporated into the top 2 inches of soil as soon as practicable after application.

We received comments from the VDEQ expressing concerns about the potential for the project to impact acid sulfate soils, which could make revegetation difficult. Section 4.1.4.4 includes a discussion of acid-producing rock and soils, including measures that Atlantic would implement to reduce potential impacts. We also note that Atlantic would obtain the applicable permits and authorizations to construct and operate the project (see table 1.4-1). As such, to the extent the state has regulatory authority and permitting jurisdiction for these features, Atlantic would consult with the VDEQ.

We received comments expressing concern about how excess rock and spoil would be disposed of during construction as well as whether and where imported fill material may be required to restore the right-of-way. As stated above, excess rock and spoil would be hauled off to an approved disposal location or used as beneficial reuse, per landowner or land management agency approval and as required by permit. At this time, neither Atlantic nor DETI have identified any areas where imported soils are planned to be used. If any area requiring imported soils is identified, Atlantic and DETI would obtain imported soil from an approved source that meets all local and federal permits. Atlantic and DETI are required to obtain the appropriate permits and authorizations for areas needed to construct and operate their projects. However, FERC notes that there are commercial areas where permits have been obtained by the owner/operator for an activity or as a resource needed for a project. These include existing, previously approved spoil and rock disposal locations. These areas function as such regardless of a proposed project, have been approved for their use by the state or county authority(ies), and are independent of FERC approval.

We received multiple comments expressing concern about constructing in steeply sloped areas and the adequacy of using SSURGO data to assess potential soil impacts along the project route. As noted in section 4.2.2, the FS, as a land-managing agency, selected an Order 1 Soil Survey methodology based on direction from the FS LRMP to use a method which inventories the soil resource to the appropriate intensity level as needed for project planning/and or design consideration. An Order 1 Soil Survey is based on a more precise degree of study, and therefore a more detailed level of information than SSURGO databases. In many cases, mapping at an Order 1 level or collecting point data may reveal inclusions within map units of soils that were not named in the official soil survey as well as use-dependent soil properties that are different from the typical soil properties listed for map units in the “official” soil survey (NRCS, 2016b). The Order 1 Soil Survey is more accurate than the official soil survey for the extent of the right-of-way on NFS lands. However, SSURGO data provide the most detailed level of soil mapping that is publicly available from the NRCS and was designed primarily for farm and ranch, landowner/user, and township, or county natural resource planning and management; therefore, SSURGO data were used in the analysis on private lands.

We received a comment that Atlantic and DETI are not adequately investigating the influence of slope percent as a variable factor in predicting soil erosion potential in rugged mountainous terrain. The commenter notes that using the Revised Universal Soil Loss Equation 2 (RUSLE2) computer model, and “holding constant the otherwise variable factors of slope length and width, soil type or class, rainfall patterns, and construction disturbance” and analyzing slope percent values ranging from 10 percent to 90 percent they obtained output values of potential soil erosion rates that ranged from 34 tons/acre/year to 549 tons/acre/year, respectively. However, because no adjustments were made for the other variable factors used in the computer model we find that this commenter’s analysis overestimates the actual erosion potential in the project area, especially once permanent erosions controls are installed and the right-of-way is stabilized and revegetated.

In order to further address these comments, we used the RUSLE2 computer model to analyze two random soil map units that would be crossed by ACP in Bath County, Virginia, the area the commenter had indicated they also analyzed. Settings in the model were adjusted to account for the specific climate zone, slope length, and construction and restoration practices that are proposed for ACP. The computer model was used to analyze four different scenarios: preconstruction conditions, construction conditions with no vegetative cover, construction conditions with temporary seeding and mulch application, and post-construction restoration conditions. Additional information on the inputs used in the analysis can be found in appendix P. Based on this analysis, we find that construction practices would temporarily increase the erosion potential for soils crossed by the project, but erosion rates should return to acceptable levels once final restoration has been completed. Atlantic's *Restoration and Rehabilitation Plan* and FERC *Plan* contain provisions for erosion control practices such as use of mulch and reestablishing vegetation within specific timeframes after construction is complete. Furthermore, because the construction timeframe is relatively short, we believe that implementation of the measures in the *Restoration and Rehabilitation Plan* and FERC *Plan* should help ensure that there would not be a substantial increase in erosion potential in the project area in the long term.

We received additional comments on the draft EIS about the RUSLE2 modelling analysis that was conducted, notably that we should analyze the entire route using the RUSLE2 computer model. We acknowledge that construction practices would temporarily increase the erosion potential for soils crossed by the project, but erosion rates should be minimal and return to acceptable levels once final restoration has been completed. Atlantic's *Restoration and Rehabilitation Plan* and the FERC *Plan* contain provisions for erosion control practices such as use of mulch and reestablishing vegetation within specific timeframes after construction is complete. Furthermore, because the construction timeframe is relatively short, we believe that implementation of the measures in the *Restoration and Rehabilitation Plan* and FERC *Plan* should help ensure that there would not be a substantial increase in erosion potential in the project area in the long term.

4.2.4 Aboveground Facility Soil Impacts

ACP and SHP aboveground facilities would be located within or generally adjacent to the projects' right-of-way. Permanent impacts on soils would occur at aboveground facilities that would be graded and graveled or where facilities would be constructed. Soil limiting characteristics at aboveground facilities are outlined in table 4.2.2-1. Construction and operation of ACP's aboveground facilities would permanently encumber 46.0 acres of prime farmland soils and 37.9 acres of farmlands of statewide importance. Construction and operation of SHP's aboveground facilities would permanently encumber 0.5 acre of prime farmland soils and 10.7 acres of farmlands of statewide importance.

4.2.5 Contractor and Pipe Yard Soil Impacts

Soil limitations associated with constructing the proposed contractor and pipe yards are outlined in table 4.2.2-1. To support construction activities, Atlantic would use a total of 24 contractor/pipe storage yards and DETI would use a total of 11 contractor/pipe storage yards on a temporary basis. As listed in table 4.8.1-1, yards would temporarily affect mixed land uses, some of that have been previously disturbed and cleared (i.e., agricultural or developed land uses). Site improvements that would be made at the contractor yards include sediment and erosion control, topsoil segregation on agricultural lands and in forested areas on NFS lands, grading, gravel base, and creation of a construction entrance. Where yards are in agricultural or residential areas, and forested areas on NFS lands, topsoil and subsoil would be tested for compaction at regular intervals and mitigated as necessary, in accordance with the FERC *Plan*. Yards would be restored in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan* or as requested by the landowner or land management agency, and would not represent new permanent impacts on soil resources. Additionally, yards would be monitored for at least two growing seasons post-construction (and three growing seasons on NFS lands) to determine the success of revegetation and correct any problems if the drainage had been modified because of construction, in accordance with the FERC *Plan*. Additional measures that would be implemented on federal lands are discussed further in section 4.2.7. Therefore, no significant impacts on soils in the pipe and contractor ware yards are anticipated.

NFS Lands

There are currently no proposed contractor or pipe yards located on the GWNF; however, there would be approximately 1.5 acres of contractor/pipe yards located on the MNF near AP-1 MP 82.7.

4.2.6 Access Road Soil Impacts

Soil limiting characteristics associated with construction proposed access roads are outlined in table 4.2.2-1. Potential impacts along access roads would be relatively minor if proper erosion controls are installed and maintained. Existing farm roads could be used, with landowner permission, to reduce potential soil resource impacts on prime farmland or farmland of statewide importance. Shallow bedrock would not be a major concern since no trenching would take place on the access roads and adjustments could be made. Erosion and sedimentation would increase along newly constructed access roads, especially those on steep slopes. For new temporary access roads, this increase would be temporary, as the roads would be reclaimed and revegetated after construction. New permanent access roads would also expose soils to erosion and sedimentation for the life of the project, but erosion controls would be used and maintained to minimize erosion and sedimentation potential.

Construction of ACP's access roads would permanently impact 168.1 acres of prime farmland and 129.5 acres of farmland of statewide importance. Construction of SHP's access roads would permanently impact 13.6 acres of prime farmland and 35.2 acres of farmland of statewide importance. Information regarding proposed improvements for permanent access roads can be found in section 4.8 and appendix E.

NFS Lands

Long-term access roads would affect approximately 91 acres on NFS lands, including 66 acres on the GWNF and 25 acres on the MNF. Temporary access roads would affect 1 acre on the GWNF.

4.2.7 Soil Impacts on Federal Lands

On May 26, 2017, Atlantic filed information related to topsoil segregation on NFS land. Atlantic indicated that an additional 25 feet of temporary workspace width would be needed at seven locations on NFS lands to accomplish the proposed segregation.

Soil impacts on NFS lands are described in detail using the Order 1 Soil Survey information in the sections above and briefly in subsequent sections below. Construction and operation impacts on soils within federal lands would be similar to that described in section 4.2.3; however, a greater detailed analysis has been done on federal lands due to the direction provided by FSM 2550 (https://www.fs.fed.us/biology/resources/pubs/soils/fsm-2550.pdf) and the MNF and the GWNF LRMPs. These documents require the agency to account for additional soil resource effects and protection that are above and beyond FERC regulation and state regulations. Atlantic developed a *COM Plan* that describes the construction, restoration, and operation measures Atlantic would implement for ACP on federal lands to avoid and minimize impacts from pipeline construction and operation. The MNF and GWNF have provided recommendations for the *COM Plan*.

In addition to the pipeline facilities, 17 access roads would be used during construction of ACP on NFS lands and would be maintained over the long-term during operation of the project. No access roads or contractor/pipe yards would be located on NFS lands, and no aboveground facilities would be located on federal lands. Two communication towers (County Power Station and Rocky Mountain MW Site) would be located within existing authorized facilities on NFS lands. There would be minor appurtenances that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by the DOT's PHMSA code.

4.2.7.1 MNF Belowground and Aboveground Soil Organic Carbon

Soil carbon stocks in the southern Appalachian Mountains vary along an elevation gradient (Garten et al., 1999). Along the elevation gradient, as much as 53 percent of soil organic carbon is contained in forest floor O horizons and other labile soil organic matter in various stages of decomposition. Most of the carbon in the mineral soil was identified as protected due to association with a heavy soil fraction (greater than 1.4 grams per milliliter) or a silt-clay fraction. Substantial losses of soil organic matter due to disturbance or as the result of a warmer climate could have long-term impacts on hydrology, soil quality, and plant nutrition in forest ecosystems. A relatively large portion of the carbon lost due to land use change in the southern Appalachian Mountains may be recaptured relatively quickly where forest growth is rapid (Bolstad and Vose, 2005).

The MNF is working towards establishing ways to incorporate carbon mitigation from large-scale soil-disturbing projects to maintain or restore ecological integrity so that ecosystems can resist change, can maintain resiliency under changing conditions, and are able to recover from disturbance.

In the Order 1 Soil Survey, soil carbon was measured both as total organic carbon and as total volatile solids (organic carbon via loss-on-ignition). The O and A horizons were high in organic carbon, with averages of 32.4 percent and 6.1 percent, respectively. The sub-soil, excluding spodic horizons, had an average organic content of 0.9 percent. The high quantity of carbon was anticipated in the surface horizons; however, the thickness of these horizons was relatively thin. Based on an estimated bulk density (not measured during survey) of 0.2 g cm^3 for the O horizons, 1.2 g cm^3 for the A horizons, and 1.4 g cm^3 for subsoil horizons, it would be estimated that the O horizons, A horizons and subsoil horizons would contain about 64.8 mg C cm^3, 73.2 mg C cm^3, and 12.6 mg C cm^3, respectively. Three test pits were observed to have contained spodic horizons in the MNF (P-012 and P-022) and in the GWNF (P-170) and had higher levels of carbon deeper in the profile (17, 14, and 5.6 inches in P-012, P-022, and P-170, respectively) in the Bhs and Bs horizons compared to non-spodic soils where percent organic carbon generally drops below 1 percent carbon for subsurface horizons. Carbon contents are dynamic because they are a balance between vegetation inputs and decomposition rates. Complete loss of these layers during construction would require decades of high inputs to recover. Conservation of these layers during construction and replacement following construction would ensure a faster recovery and provide ecosystem services that would assist in the restoration of these habitats.

Existing soil carbon stocks in the project area would be disturbed primarily by trench excavation and cut and fill construction activities. To estimate the soil carbon content of the pipeline trench and cut and fill sites of ACP in the MNF, the FS used the following data and approach (see the methodologies in appendix P):

- ACP Order 1 Soil Survey carbon analyses;
- Regional soil bulk density values obtained from the NRCS and best professional judgement; and

- Soil volume (adjusted for coarse fragment content) based on the cross-sectional area and depth of the pipeline trench (7.5 feet) and the Order 1 Soil Survey map unit lengths.

Pipeline trench excavation, tree canopy removal, and the temporary storage activities for topsoil and subsoil material during construction would alter the normal temperature, moisture content, and air exchange relationships for these soils as they are handled, thereby affecting carbon content. This may lead to more rapid decomposition and loss of soil carbon. In particular, the active carbon pool (3 to 8 percent of C in the total soil C pool) is especially sensitive to disturbance due to its Mean Residence Time being on the order of tens to hundreds of days (Paul and van Veen, 1978; Trumbore et al., 1996). The Mean Residence Time of the active carbon pool would essentially be exceeded when topsoil and subsoil are stockpiled for 100 days or more during construction with a potential loss of the entire active carbon pool from the stockpiled soils. The calculations performed by the FS do not account for the qualitative analysis of the type or form of carbon that is being extracted, lost, and/or replaced.

By using the above outlined methodology, the FS has estimated the total soil carbon content of MNF trench and cut and fill soils to be approximately 2,175 U.S. tons. Loss of the entire active carbon pool (8 percent of total carbon in the trench soils) would result in a loss of approximately 174 U.S. tons of carbon.

The FS calculated the amount of C lost due to the removal of bole wood from the right-of-way during construction. Because tops and roots are typically left on site, they were not included in the C loss calculations.

The FS acknowledges that some carbon from those sources would be lost to the atmosphere during microbial decomposition processes, but estimates are not available in the literature to separate the percentages of carbon lost to the atmosphere from percentages returned to the soil from decomposition of tree tops and roots. Consequently, the aboveground losses likely underestimate the actual C losses from tree removal.

Aboveground C was calculated using the following methods (see the methodologies in appendix P):

- Data for estimating aboveground carbon losses were obtained from the Forest Inventory and Analysis branch of the FS (Miles, 2016). The values provided are summaries by state and landowner from Miles (2016), thus only the data pertaining to NFS lands in West Virginia were used.

- The values in the Forest Inventory and Analysis estimates include all aboveground carbon, including tops for stems greater than 1-inch diameter at breast height (DBH). Consequently, those values were adjusted using a value of 70 percent to determine the portion of carbon associated with only bole wood. The 70 percent adjustment value was obtained as the estimate of the bole wood volume from total above ground volume for hardwood species (Jenkins et al., 2003; Freedman et al., 1982; Ker, 1980).

- The total area from the Forest Inventory and Analysis dataset that applies to the National Forest ownership and carbon estimate also was obtained from Miles (2016).

The amount of C calculated based on the aboveground C loss approach described above from bole wood removal was 2,505 U.S. tons.

As part of the restoration and revegetation of the right-of-way following construction, Atlantic has proposed the use of an organic soil amendment, ProGanics™ Biotic Soil Media™, and the application of an erosion control material, Flexterra® High Performance-Flexible Growth Medium™. These soil amendments would be applied to the entire area of disturbance on the MNF. Atlantic has agreed to apply twice the minimum application rate of each, which would fully replace the calculated soil carbon loss.

4.2.7.2 Forest Service Soil Standards

The LRMPs for the MNF and GWNF include standards and guidelines for maintaining restoring, or improving soil quality, productivity, and function within each National Forest. Guidelines within the LRMPs of the MNF and GWNF require the soil inventory to be performed to a level that the management action requires for interpretations. Based on recommendations from the FS, Atlantic completed an Order 1 Soil Survey along the available sections of the pipeline route to document slope, soil type, soil texture and structure, soil mineralogy, pH, rock fragment, depth to bedrock, bedrock structure, parent material, presence of pans, indications of past slopes failures, the presence of subsurface water tables, an analysis of organic horizons, an assessment of below ground carbon stocks, and a soil chemistry analysis for the presence of base poor soils. Atlantic filed soil reports upon completion of the surveys. Data that were collected during the Order 1 Soil Survey will be used for this effects analysis as well as to make informed decisions related to design, construction, restoration, and maintenance of the proposed pipeline on NFS lands.

To identify measures to minimize potential soil impacts, Atlantic has prepared a *COM Plan* with active participation and engagement from the FS. The MNF and GWNF are managed under LRMPs issued in 2011 and 2014, respectively. The LRMPs are comprehensive planning documents designed to guide land management decisions within the National Forest boundaries. The LRMPs describe desired conditions and outline standards and guidelines to be followed to achieve those conditions. All land-disturbing activities on NFS lands must follow, at a minimum, to the most restrictive of the two sets of standards and guidelines; either the LRMPs for the MNF and GWNF, or to the FERC *Plan* and *Procedures*.

The following list provides management direction related to soils for NFS lands. The FS has provided guidance to Atlantic for complying with this direction through comments on the *draft COM Plan* and other filings related to slope stability and maintenance of soil productivity.

- **Monongahela National Forest**
  - <u>Goal SW01</u>: Maintain, restore, or improve soil quality, productivity, and function. Manage soil disturbances from management activities such that they do not result in long-term loss of inherent soil quality and function.
  - <u>Goal SW02</u>: Collect, interpret, and display information on Forest soils to:
    - Determine the kinds and intensities of soil resource inventories needed;
    - Identify relationships between soil types and the growth of trees or other vegetation;
    - Predict effects to soil and water resources caused by various management options applied to specific tracts of land; and
    - Provide information to aid in multiple-use management that does not impair the productivity of the land.
  - Identify limitations on management practices and mitigation measures by soil mapping unit for activities that have potential to impact soil and water resources.

- Standard SW03: Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time that soil is exposed on disturbed sites or retained in an impaired condition.

- Standard SW04: Erosion prevention and control measures shall be used in program and project plans for activities that may reduce soil productivity or cause erosion.

- Standard SW06: Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area.

- Standard SW07: Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions:

    - Steep Slopes (40 to 50 percent) – Operation on these slopes shall be analyzed on a case-by-case basis to determine the best method of operation while maintaining soil stability and productivity.

    - Very Steep Slopes (more than 50 percent) – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.

    - Susceptible to Landslides – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.

    - Soils Commonly Wet at Or Near the Surface During a Considerable Part of The Year, Or Soils Highly Susceptible to Compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur.

- Standard SW08: Management actions that have the potential to contribute to soil nutrient depletion shall be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions.

- Guideline SW10: Inventory the soil resource to the appropriate intensity level as needed for project planning and/or design considerations.

- Guideline SW11: Soil stabilization procedures should take place as soon as practical after earth-disturbing activities are completed or prior to extended periods of inactivity. Special revegetation measures may be required.

- Guideline SW13: Consider liming soils with a surface pH of less than 5.5 on seeding projects, except where there is an objective to maintain acidic ecosystems.

- Guideline SW14: Mulch should be applied on severely eroded areas, or areas with high potential for erosion, such as new road cut and fill slopes.

- Guideline SW15: Topsoil should be retained to improve the soil medium for plant growth on areas to be disturbed by construction. Topsoil should be salvaged from an area during construction and stockpiled for use during subsequent reclamation, or obtained from an alternate site. On some areas, soil material may have to be added to obtain vigorous plant growth. Soil to be used for this purpose should have chemical tests made to determine its desirability for use.

- Guideline SW16: Where the removal of vegetative material, topsoil, or other materials may result in erosion, the size of the area may be limited from which these materials are removed at any one time.

- Guideline SW17: During watershed or project-level analysis, incorporate soil protection or improvement into project planning through awareness of:

    - soil, geology, and landform conditions;

    - the inherent capability of the soils involved; and

    - the degree and duration of soil disturbance.

- Guideline SW60: Crossings should be designed so stream flow does not pond above the structure during normal flows to reduce sediment deposition and safely pass high flows.

- Guideline SW18: Topsoil or substitute materials used in reclamation should consist of friable soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign material.

- Guideline SW19: Management activities that may result in accelerated erosion and loss of organic matter should have one or more of the following practices applied to mitigate potential effects:

    - limiting mineral soil exposure;

    - appropriately dispersing excess water;

    - ensuring sufficient effective groundcover;

    - stabilizing disturbed soils through revegetation, mulching, or other appropriate means;

    - preventing or minimizing excessive compaction, displacement, puddling, erosion, or burning of soils; and

    - preventing or minimizing the initiation or acceleration of mass soil movement (e.g., slumps, debris flows, or landslides).

- **George Washington National Forest**

  - Desired Condition RDF-05: Facilities reflect the natural and cultural landscape, and provide optimal service to customers and cooperators. They are in good condition, safe, clean, structurally sound, energy efficient and accessible to all users.

  - Standard 11-003: Management activities expose no more than 10 percent mineral soil within the project area riparian corridor.

  - Standard FW-1: Resource management activities that may affect soil and/or water quality meet or are more stringent than Virginia and West Virginia Best Management Practices, State Erosion Control Handbooks, and standards in this Forest Plan.

  - Standard FW-5: On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat will be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years. (The activity area is the area of potential soil disturbance expected to produce vegetation in the future, for example: timber harvest units, prescribed burn area, grazing allotment, etc.)

  - Standard FW-6: Locate and design management activities to avoid, minimize, or mitigate potential erosion.

  - Standard FW-7: Use ditchlines and culverts when new permanent road construction grades are more than 6 percent and the road will be managed as open for public use.

  - Standard FW-8: Water saturated soils in areas expected to produce biomass should not receive vehicle traffic or livestock trampling to prevent excessive soil compaction.

  - Standard FW-9: Where soils are disturbed by management activities, appropriate revegetation measures should be implemented. When outside the normal seeding seasons, initial treatments may be of a temporary nature, until permanent seeding can be applied. Revegetation should be accomplished within 5 years. For erosion control, annual plants should make up greater than 50 percent of seed mix when seeding outside the normal seeding season and the area should be reseeded with perennials within 1.5 years.

  - Standard FW-12: Clearcutting is not allowed where high risk soils (as described in Chapter 3-Management Approach for Soils and in the Glossary) are identified.

  - Standard FW-16: Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone.

  - Standard FW-125: Use advanced harvesting methods (such as cable or helicopter) on sustained slopes 35 percent or greater to avoid adverse impacts to the soil and water resources.

  - Standard FW-139: Log landings will be located outside of riparian corridors.

- o Standard FW-140: All equipment used for harvesting and hauling operations will be serviced outside of riparian corridors.

- o Standard FW-141: When necessary, landings will be ripped to a depth of 6 to 8 inches to break up compaction, and to ensure soil productivity and the successful reestablishment of vegetation.

- o Standard FW-142: Skid trails may cross riparian corridors at designated crossings. If crossing a perennial or intermittent stream is unavoidable, use a temporary bridge or other approved method within the State BMPs. All streams are crossed at as close to a right angle as possible. Stabilization of skid trails will occur as soon as possible to minimize soil movement downslope.

- o Standard FW-143: Skidding of trees should be directed in a manner that prevents creation of channels or gullies that concentrate water flow to adjacent streams.

- o Standard FW-144: Temporary stream crossings will be removed and rehabilitated.

- o Standard FW-145: Dips or waterbars or other dispersal methods will be constructed and maintained to direct stormwater off skid trails and reduce potential sediment flow to streams.

- o Standard FW-146: Designated trails will not be used as skid trails. Crossing of designated trails should be minimized and should occur at right angles to the extent feasible. Implement needed restorative measures to damaged trail tread.

- o Standard FW-231: Revegetate during seeding seasons on construction sites where slopes are greater than 5 percent.

Successful revegetation is dependent on appropriate soil conditions and can be influenced by several factors, including soil fertility, texture, drainage class, salinity, and acidity. Unless otherwise approved by the FS, soil restoration will include the following measures, as described in the *COM Plan*:

- removal of excavated rock before lowering-in;

- distribution of rock on the work area;

- grading of the rights-of-way to restore preconstruction contours to the extent practicable;

- applying soil amendments, permanent seed, mulch and/or erosion control material;

- reclaiming temporary access roads and restoring any paved surfaces to original condition; and

- removing temporary sediment barriers from an area when replaced by permanent erosion control measures or when the area has been successfully restored to uniform 70 percent perennial vegetation. Temporary erosion control BMPs would not be removed until inspection by the EI to confirm site stabilization.

All topsoil must be segregated on all areas of NFS land. Where topsoil segregation is performed on the MNF and GWNF, the O and A horizons would be segregated from the transition soil horizons AB/

BA. O horizon soils are defined as a soil layer containing a high percentage of organic matter. A horizon soils are defined as the dark subsoil below the O horizon. AB/BA horizon soils are defined as light colored subsoils located below the O and A horizons. Because of the increased need for additional right-of-way width and loss of additional forestland, and the need to remove stumps, which would increase topsoil mixing with subsoil and the increase the potential for erosion, topsoil segregation is generally not conducted in forested areas.

Atlantic would conduct topsoil segregation in accordance with the *COM Plan*. Additional measures to protect segregated topsoil include, but are not limited to:

- maintaining separation of salvaged topsoil and subsoil throughout all construction activities;
- leaving gaps in the topsoil piles and spoil piles for the installation of temporary slope breakers to allow water to be diverted off the construction right-of-way;
- stabilizing topsoil piles and minimizing loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, or functional equivalents; and
- installing necessary perimeter dikes, berms, sediment basins, and other sediment controls prior to topsoil stripping.

On November 12, 2015, Atlantic submitted a SUP proposal to the FS to construct, operate, maintain, and eventually decommission a natural gas transmission pipeline that crosses lands and facilities administered by the FS. In addition to potentially issuing a SUP, there is a need for the FS to consider amending affected LRMPs to make provision for the ACP right-of-way. As previously noted, the MNF and GWNF reviewed the *COM Plan* and the Order 1 Soil Survey data that was collected on FS lands. The FS has provided comments on the *COM Plan* and Order 1 Soil Survey, and Atlantic will continue to consult with the FS to address its comments.

4.2.8 Conclusion

Construction-related impacts on soils would be temporary and localized to the construction workspace, except where erosion, sedimentation, landslides, and other forms of soil movement affect adjacent areas. Where these impacts may occur, there would be isolated, adverse effects to soil quality. Performance measures for addressing final soil productivity and soil quality during restoration activities on NFS lands are currently being developed by the FS and Atlantic.

While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, and has sited the pipeline to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the factors above, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur. However, Atlantic and DETI would comply with DOT regulations, specifically 49 CFR 192.317(a), which require pipeline operators to protect transmission pipelines from hazards, including landslides. Regulations at 49 CFR 192 also specify pipeline design requirements to ensure safe pipeline operation and include pipe stress requirements/testing and require consideration of external loads in pipeline design. Adherence to the DOT's pipeline safety regulations would minimize the risk of landslides in the project area.

In areas where slope instability is not a factor, we conclude that small, localized, and temporary impacts on soil resources could occur; however, the impacts would be minimized and mitigated through Atlantic's and DETI's construction and restoration plans.

Impacts on the soil resource in NFS managed lands would range in duration from temporary to permanent. As defined in FSM 2550, the detrimental changes to soil properties that result in loss of the inherent ecological capacity or hydrologic function of the soil is termed Substantial Soil Impairment when the changes last beyond the scope, scale, or duration of the project causing the change (https://www.fs.fed.us/biology/resources/pubs/soils/fsm-2550.pdf). Construction activities along the right-of-way may adversely affect soil resources with both temporary and permanent impacts even if mitigation is applied because not all effects are completely mitigatable or the effectiveness of techniques used are not 100 percent effective. Inadequate restoration of subsoil and topsoil could result in poor revegetation, decreased soil stabilization, increased erosion and sedimentation, settling over the buried pipeline, and subsequent loss of soil carbon. Long-term effects to the soil resource would include areas that would not be restored post-construction, such as long-term access roads due to the conversion of the soil resource to a severely compacted road. The soil resource would not return to natural productivity unless complete restoration occurs. In these situations, irretrievable and irreversible impacts on the soil resource would occur, as defined by FSM 2550 (https://www.fs.fed.us/biology/resources/pubs/soils/fsm-2550.pdf). Another permanent impact associated with the transition from a forested environment to a managed right-of-way is the alteration of the soil carbon budget. Successful revegetation would reduce this impact, but if the right-of-way is managed as a grassland/shrub environment, the soil carbon budget would be different from the adjacent forest.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Existing Groundwater Resources

Principal bedrock aquifers, including late Paleozoic and early Mesozoic sedimentary formations as well as crystalline rocks, comprise the major source of groundwater along the proposed routes of both ACP and SHP. Figure 4.3.1-1 uses USGS (2016) coverage to illustrate the major aquifers closest to the ground surface traversed by the projects. As shown, SHP route crosses the Pennsylvanian aquifer and the ACP route crosses the Pennsylvanian, Mississippian, Valley and Ridge, Piedmont and Blue Ridge Crystalline-rock, and Early Mesozoic Basin aquifers, as well as the Northern Atlantic Coastal Plain aquifer system (USGS, 2003). These aquifer systems are further described below.

In addition to principal aquifers, ACP and SHP cross areas with unconsolidated alluvial deposits in stream valleys that constitute minor surficial aquifers for private wells across the region. ACP also crosses minor aquifer areas mapped as "Other Rocks," which represent areas underlain by crystalline rocks of minimal permeability.

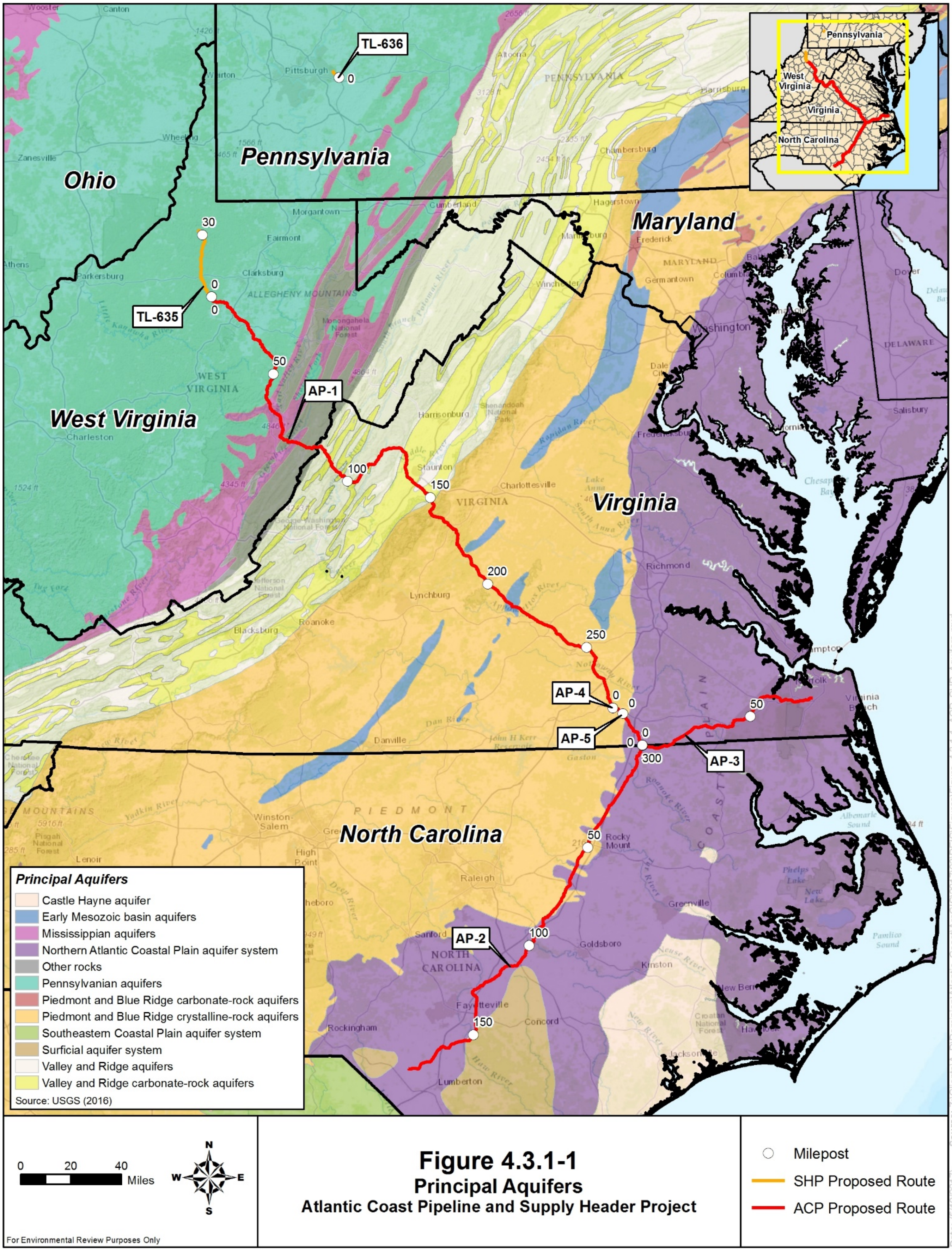

Figure 4.3.1-1
Principal Aquifers
Atlantic Coast Pipeline and Supply Header Project

Pennsylvanian and Early Mesozoic Basin Aquifers

The Pennsylvanian and Early Mesozoic Basin aquifers consist of indurated sedimentary strata, with most water production occurring from the sandstone units (USGS, 1997a). Because induration has greatly reduced the primary pore space in the sandstones, the permeability effected by the secondary porosity is dominant. Therefore, most of the groundwater in the formation occurs in and is transmitted through joints, fractures, and bedding planes. The hydraulic conductivity of sandstone aquifers is low to moderate, but because the units are extensive, these aquifers can be highly productive (USGS, 1999a).

As of 2005, 131 million gallons per day (gpd) of water was extracted from the Early Mesozoic basins aquifers, including 41.9 million gpd in Pennsylvania and 2.1 million gpd in Virginia. Water withdrawals from Pennsylvanian aquifers were 132 million gpd, including 43.6 million gpd in Pennsylvania and 18.3 million gpd in West Virginia (Maupin and Barber, 2005).

Mississippian and Valley and Ridge Aquifers

The Mississippian aquifers mostly consist of water-bearing carbonate strata. While considered principle aquifers in many regions of the United States, they are limited in geographic extent and only produce water locally within the ACP area, (USGS, 1997a). As of 2005, regional, collective water withdrawals from the Mississippian carbonate aquifers were 286 million gpd. In the ACP area water withdrawals from the carbonate aquifers were 0.9 million gpd in West Virginia and 0.1 million gpd in Virginia (Maupin and Barber, 2005).

The Valley and Ridge aquifers consist primarily of folded sandstone, shale, and limestone. In Virginia, these rock formations also contain coal and minor amounts of dolomite and conglomerate with occurrences of metamorphic quartzite, slate, and marble. Carbonate rocks comprise the most productive strata within the Valley and Ridge aquifers (USGS, 1997b), with water withdrawals of 95 million gpd, including 34.2 million gpd in Virginia (Maupin and Barber, 2005).

Carbonate rocks with well-developed karst features can yield large amounts of water to wells that penetrate water conduits, while the competent rock matrix (primary permeability) is, for practical purposes, impermeable (USGS, 1999b). Karst features are further discussed in section 4.1.2.3.

Piedmont and Blue Ridge Crystalline-Rock Aquifers

The major Piedmont and Blue Ridge aquifers consist primarily of Tertiary gravels, Permian to Proterozoic crystalline metamorphic and igneous rocks, and occurrences of productive carbonate rocks of Cambrian age, and provide the greatest well yields of that aquifer system (USGS, 1997c). Because the primary permeability of the crystalline rocks is negligible for practical purposes, well yields are limited to the secondary porosity and permeability created by joints and fractures in the bedrock and generally yield only small volumes of water. However, given the great areal extent of the crystalline bedrock aquifer system, significant volumes of water are available from these formations. As of 2000, the total water withdrawal from the Piedmont and Blue Ridge carbonate-rock aquifers was 29.9 million gpd, but was confined to Maryland and Pennsylvania (Maupin and Barber, 2005). During that same year, water withdrawals from the Piedmont and Blue Ridge crystalline-rock aquifers totaled 146 million gpd, including 14.5 million gpd in Virginia and 62.6 million gpd in North Carolina (Maupin and Barber, 2005).

North Atlantic Coastal Plain Aquifer System

The Northern Atlantic Coastal Plain aquifer system is comprised largely of semi-consolidated sand aquifers, ranging from Cretaceous to Quaternary in age, separated by clay semi-confining and confining units relatively close to the ground surface. The uppermost surficial unconsolidated sand aquifer is susceptible to human activities owing to its shallow depth in some areas (USGS, 1997d). Additionally, Coastal Plain aquifer sediments are thin near their contact with rocks of the Piedmont Province, and may not yield as much water as the underlying metamorphic rocks of the Piedmont aquifers (USGS, 1997e). The Northern Atlantic Coastal Plain aquifer system also includes a productive limestone aquifer. As of 2015, water withdrawals from the Northern Atlantic Coastal Plain aquifer system were 1,040 million gpd, including 90.8 million gpd in Virginia and 142 million gpd in North Carolina (Maupin and Barber, 2005). The limestone aquifer is most productive in North Carolina, where yields reached 125 million gpd in 1985 (USGS, 1997d).

4.3.1.2 Sole Source Aquifers

The EPA defines a sole source aquifer or principal source aquifer area as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer (EPA, 2016a).

There are currently no EPA-designated sole source aquifers in West Virginia or North Carolina. There are only two EPA-designated sole source aquifers in Virginia, but neither is in proximity to ACP facilities. Although there are two sole source aquifers in Pennsylvania, neither is within 140 miles of the nearest SHP facilities (EPA, 2016a).

4.3.1.3 State-Designated Aquifers

The WVDEP and West Virginia Department of Health and Human Resources (WVDHHR) do not designate sole source aquifers on a State level (Paucer, 2015; Shaver, 2015). Similarly, the North Carolina Department of Environmental Quality (NCDEQ), Division of Water Resources (DWR) does not designate sole source aquifers on a State level (Johnson, 2015).

The VDEQ, in accordance with the Ground Water Management Act of 1992, regulates groundwater withdrawal within two Ground Water Management Areas: 1) the Eastern Virginia Groundwater Management Area, and 2) the Eastern Shore Groundwater Management Area. ACP crosses 70.3 miles of the Eastern Virginia Groundwater Management Area within Suffolk, Chesapeake, and Southampton Counties (VDEQ, 2014a). The Eastern Shore Groundwater Management Area is in Accomack and Northampton Counties, over 25 miles northeast of the nearest ACP facility.

The PADEP Bureau of Safe Drinking Water does not designate sole source aquifers on a Commonwealth level and defers to EPA-designated sole source aquifers in the region (Reisch, 2015).

4.3.1.4 Wellhead and Aquifer Protection Areas

Under the Safe Drinking Water Act (SDWA), each state is required to develop and implement a Wellhead Protection Program to identify the land and recharge areas contributing to public supply wells and prevent the contamination of drinking water supplies. The SDWA was updated in 1986 with an amendment requiring the development of a broader-based Source Water Assessment Program, which includes the assessment of potential contamination to both groundwater and surface water through a watershed approach. A Wellhead Protection Area (WHPA) encompasses the area around a drinking water well where contaminants could enter and pollute the well.

Pennsylvania

A review of data from the Pennsylvania Groundwater Information system did not identify any WHPAs that would be crossed by SHP facilities in Pennsylvania (PADCNR, 2015).

West Virginia

In West Virginia, the WVDHHR administers the Source Water Assessment and Wellhead Protection Program. In consultation with the WVDHHR (2016), Atlantic identified four WHPAs crossed by ACP in West Virginia:

- Elk Springs Resort Well is a non-community well located approximately 168 feet south of a permanent access road near AP-1 MP 59.5 in Randolph County. The access road would cross 0.1 mile of the WHPA;

- Pocahontas County High School Well is a non-transient non-community well located approximately 208 feet south of a permanent access road near AP-1 MP 78.1 in Pocahontas County. The access road would cross 0.4 mile of the WHPA;

- Seneca State Forest Picnic Shelter Well is a non-community well located approximately 1,210 feet northeast of a permanent access road near AP-1 MP 78.1 in Pocahontas County. The access road would cross 0.4 mile of the WHPA; and

- Camp Twin Creeks Well is a non-community well within a temporary contractor yard which is located approximately 10.6 miles south of AP-1 MP 81.0 in Pocahontas County.

SHP does not cross any WHPAs.

Virginia

The VDEQ and Virginia Department of Health (VDH) oversee a *Wellhead Protection Plan* for the Commonwealth of Virginia that provides a framework for establishing WHPAs. Atlantic consulted with the VDH-Office of Drinking Water (ODW) and did not identify any public water wells that may have state-designated wellhead protection areas crossed by ACP.

The Augusta County Service Authority is responsible for public water production and distribution to approximately 14,600 customers. The Service Authority implemented a source water protection ordinance in 2011 which establishes Zone 1 Wellhead Protection Areas (1,000-foot radius around fixed public water sources designed to protect wells from accidental or intentional introduction of contaminants) and Zone 2 Wellhead Protection Areas (recharge boundaries deemed necessary to protect fixed public water sources). According to data provided by Atlantic and the Service Authority, the AP-1 mainline would cross Zone 2 of the Deerfield Well from AP-1 MPs 106.7 to 109.2, but is located outside the recharge contributing zone of the Deerfield Well. The AP-1 mainline would also cross the western boundary of Zone 2 of the Gardner Spring Well/Spring.

North Carolina

The NCDEQ (2015) provided Atlantic with statewide digital data for WHPAs in North Carolina. The proposed facilities do not cross any WHPAs.

4.3.1.5 Water Supply Wells and Springs

Atlantic and DETI provided data for water supply wells and springs identified within 0.25 mile of HDD sections, 500 feet of facilities in karst areas (based on Weary and Doctor, 2014) and for the portion of ACP between AP-1 MPs 59 and 157, and within 150 feet of the workspace for the remainder of ACP and SHP facilities. To obtain information on public water supply wells, data were reviewed from the following sources: WVDHHR Source Water Assessment and Wellhead Protection Program, VDH-ODW, NCDEQ-DWR, and PADEP Bureau of Safe Drinking Water. Data on private wells near ACP and SHP were derived from various source, including landowner interviews and field surveys. The location of known public and private water supply wells near ACP and SHP are summarized in table 4.3.1-1. Four public and 236 private water supply wells were identified near ACP, and 18 private wells were identified near SHP. One of the public wells and 12 of the private wells are within the ACP workspace, and 1 is within the SHP workspace.

Table 4.3.1-2 summarizes springs that Atlantic and DETI identified near the project. A total of 124 springs were identified near ACP, and 4 springs were identified near SHP.

Atlantic and DETI continue to communicate with landowners to complete surveys for private water supply sources (wells and springs). Because Atlantic and DETI have not completed field surveys for water wells and springs due to a lack of survey access, **we recommend that:**

- **<u>Prior to construction</u>, Atlantic and DETI should complete the remaining field surveys for wells and springs within 150 feet of the construction workspace, and within 500 feet of the construction workspace in karst terrain, and file the results, including type and location, with the Secretary.**

We received comments on the draft EIS from landowners who contend that Atlantic has under-reported the number of wells and springs or seeps in proximity of the proposed pipeline route. In the event previously unidentified wells, springs, or seeps are encountered during construction, Atlantic and DETI would implement measures in their construction plans to reduce impacts and maintain the flow of water or springs/seeps, including the use of mats to minimize rutting, diverting the flow of springs/seeps across the construction right-of-way as necessary, and restoring the ground surface to original contours as closely as practicable to re-establish original flow.

4.3.1.6 Contaminated Groundwater

A corridor database search using various publicly available databases was conducted to identify various facilities with potential and/or actual sources of contamination that could impact nearby groundwater. The EPA’s Facility Registry System map service was used to locate Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS; also known as Superfund sites) and the Assessment, Cleanup and Redevelopment Exchange System (ACRES) sites within 1.0 mile of ACP and SHP centerlines or associated facilities (EPA, 2014). Additionally, state databases were evaluated to identify landfill and solid waste facilities within 0.5 mile of the projects, and leaking underground storage tanks for petroleum within 1,000 feet of the projects.

TABLE 4.3.1-1

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
West Virginia			
Harrison	0.0	Private	78, NE
	0.0	Private	Within Workspace
	1.1	Private	95, W
Lewis	5.7	Private	10, SW
	7.7	Private	Within Workspace
	12.6	Private	71, SW
	15.5	Private	143, NE
	17.3	Private	68, W
Upshur	21.4	Private	7, E
	32.0	Private	39, NE
	32.0	Private	Within Workspace
	41.3	Private	116, SW
Randolph	60.7	Private	163, W
Pocahontas	78.1 (Access Road)	Public (Pocahontas County High School)	122, S
	76.3	Private	131, NE
	76.6	Private	89, NE
	76.6	Private	Within Workspace
	76.6	Private	Within Workspace
	76.7	Private	102, NE
	81.1	Private	34, S
	81.1	Private	210, SE
Bath	93.0	Private	116, NE
	100.8	Private	341, N
	101.0	Private	144, S
	101.0	Private	34, SE
	101.1	Private	178, SE
	101.2	Private	194, S
	101.5	Private	147, N
	101.5	Private	135, E
	101.6	Private	252, E
	101.7	Private	319, N
	101.7	Private	165, N
	103.0	Private	332, N
	105.8	Private	324, SE
Augusta	108.3	Private	243, SW
	108.6	Private	75, N
	108.7	Private	367, W
	109.7	Private	316, S
	110.0	Private	319, SW
	110.0	Private	271, SW
	111.0	Private	449, W

TABLE 4.3.1-1 (cont'd)

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
	111.0	Private	187, NW
	111.0	Private	187, NW
	111.6	Private	384, NW
	111.6	Private	52, NE
	112.6	Private	144, W
	112.6	Private	325, SE
	112.7	Private	89, NW
	112.8	Private	267, SW
	112.8	Private	464, W
	113.4	Private	109, N
	113.4	Private	213, N
	114.3	Private	498, NW
	115.7	Private	441, NW
	121.0	Private	431, N
	125.0	Private	248, SW
	125.3	Private	367, NE
	125.8	Private	264, SW
	126.0	Private	499, NE
	127.5	Private	107, NE
	127.6	Private	373, NW
	127.7	Private	404, NW
	129.2	Private	36, NW
	129.3	Private	197, E
	129.7	Private	392, W
	129.7	Private	83, W
	129.7	Private	302, W
	130.5	Private	330, W
	130.5	Private	136, W
	130.5	Private	207, E
	131.7	Private	446, W
	131.6	Private	227, W
	133.1	Private	300, W
	133.4	Private	291, W
	133.4	Private	395, NE
	133.5	Private	275, W
	133.5	Private	243, NE
	134.2	Private	304, SE
	134.6	Private	331, S
	134.6	Private	126, N
	134.6	Private	304, NE
	136.7	Private	191, SW
	136.8	Private	367, SW
	137.1	Private	474, N
	144.2	Private	174, SW
	146.5	Private	281, S
	146.6	Private	312, S
	149.6	Private	22, SW
	149.7	Private	302, SW

TABLE 4.3.1-1 (cont'd)

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
	149.8	Private	108, SW
	155.2	Private	129, E
	156.4	Private	123, E
Buckingham	200.0	Private	122, W
	200.6	Private	107, NE
	200.8	Private	Within Workspace
Cumberland	213.5	Private	144, W
	215.8	Private	77, S
	215.9	Private	87, NE
	219.8	Private	37, W
Prince Edward	222.4	Private	8, SW
	224.5	Private	97, NE
Nottoway	234.8	Private	126, NE
	235.6	Private	88, W
	242.5	Private	100, S
	246.6	Private	137, S
	247.0	Private	141, NE
	247.0	Private	Within Workspace
	247.1	Private	Within Workspace
Dinwiddie	255.9	Private	1, NW
	255.9	Private	Within Workspace
Brunswick	275.6	Private	145, SW
	280.5	Private	126, NW
	280.9	Private	64, S
AP-2 Mainline			
North Carolina			
North Hampton	6.3	Private	124, S
Halifax	26.0	Private	95, NW
Nash	34.7	Private	11, NW
	40.2	Private	97, W
	40.2	Private	74, W
	40.5	Private	134, NW
	40.7	Private	1,162, SE
	40.7	Private	342, NW
	40.8	Private	332, NW
	40.9	Private	1,003, NW
	43.3	Private	26, S
	43.5	Private	52, S
	45.5	Private	112, NW
	45.7	Private	68, S
	45.8	Private	28, NW
	46.2	Private	1, SE
	46.5	Private	107, S
	46.5	Private	138, W
	47.6	Private	Within Workspace
	50.2	Private	135, N
	52.3	Private	75, NW
	52.3	Private	112, W

TABLE 4.3.1-1 (cont'd)

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
	52.5	Private	66, NW
	59.3	Private	1143, NW
	59.7	Private	40, SE
	63.6	Private	89, NW
	65.1	Private	134, W
Wilson	67.5	Public (Town of Sims)	Within Workspace
	69.1	Private	142, N
Johnston	80.1	Private	96, NW
	80.1	Private	78, NW
	80.9	Private	51, NW
	82.0	Private	108, NW
	82.8	Private	1,041, SE
	93.5	Private	93, E
	105.9	Private	126, SE
	109.2	Private	137, NW
	109.6	Private	133, NW
	112.4	Private	21, S
Sampson	115.2	Private	140, NW
	119.0	Private	65, N
Cumberland	128.2	Private	110, S
	146.6	Private	Within workspace
	146.7	Private	33, E
	148.5	Private	34, SE
	154.4	Private	898, N
	159.1	Private	103, W
	159.3	Private	31, S
Robeson	182.6	Private	63, W
AP-3 Lateral			
Virginia			
Southampton	20.8	Private	68, NW
	26.5	Private	48, S
	33.1	Private	73, NW
	38.3 (HDD Entry of Blackwater River)	Public (Kingsdale Artis Well)	1,002, NW
Suffolk	45.9	Private	148, NE
	60.1	Private	141, N
	60.5	Private	132, S
	60.7	Private	1,115, NW
	61.3	Private	1,085, SE
Chesapeake	71.2 (HDD of Hwy. 58)	Public (City of Chesapeake – Northwest River Sys; Western Branch Well No. 1)	1,271, NE
	77.5	Private	866, S
	77.5	Private	855, S
	77.5	Private	1,204, S
	77.6	Private	902, SE
	77.6	Private	931, SE
	77.6	Private	1,185, SE

TABLE 4.3.1-1 (cont'd)

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
	77.7	Private	800, SW
	77.8	Private	15, S
	78.4	Private	22, S
	78.4	Private	47, S
	78.4	Private	329, S
	78.6	Private	59, S
	78.7	Private	1,081, N
	78.8	Private	1,246, S
	78.8	Private	821, S
	78.8	Private	780, S
	78.9	Private	924, S
	78.9	Private	910, S
	79.0	Private	1,093, N
	79.0	Private	1,243, N
	79.0	Private	974, S
	79.0	Private	1,314, S
	79.0	Private	1,207, S
	79.0	Private	1,315, S
	79.1	Private	347, S
	79.1	Private	290, S
	79.1	Private	352, S
	79.1	Private	177, S
	79.1	Private	361, S
	79.1	Private	524, S
	79.1	Private	443, S
	79.1	Private	852, S
	79.1	Private	792, S
	79.1	Private	753, S
	79.1	Private	235, S
	79.1	Private	243, S
	79.2	Private	62, S
	79.2	Private	Within Workspace
	79.2	Private	581, S
	79.2	Private	73, S
	79.2	Private	772, N
	79.2	Private	947, S
	79.2	Private	799, N
	79.2	Private	373, N
	79.2	Private	101, S
	79.2	Private	1,224, S
	79.2	Private	780, N
	79.2	Private	367, S
	79.2	Private	1,108, S
	79.2	Private	405, N
	79.2	Private	750, S
	79.2	Private	317, S
	79.3	Private	561, N
	79.3	Private	442, S

TABLE 4.3.1-1 (cont'd)

Water Wells near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Milepost	Type/Name (if Public)	Distance (feet) and Direction from Workspace
	79.3	Private	589, N
	79.3	Private	872, SE
	79.3	Private	825, N
	79.3	Private	26, S
	79.3	Private	765, N
	79.3	Private	676, N
	79.3	Private	267, S
	79.3	Private	213, S
	79.3	Private	386, N
	79.4	Private	13, S
	79.4	Private	133, S
	79.5	Private	187, S
	79.8	Private	338, S
	79.8	Private	62, NE
	80.0	Private	121, N
AP-4 Lateral	None identified		
AP-5 Lateral	None identified		
Aboveground Facilities	None identified		
SUPPLY HEADER PROJECT			
TL-635 Loopline			
West Virginia			
Harrison	0.2	Private	52, NE
	0.2	Private	22, NE
	0.3	Private	130, SW
Doddridge	7.9	Private	58, SW
	9.4	Private	23, E
	9.5	Private	143, W
	9.5	Private	21, W
	15.2	Private	117, E
	18.5	Private	150, SE
Wetzel	28.1	Private	44, NE
	29.6	Private	56, S
	30.9	Private	35, E
	30.9	Private	Within Workspace
TL-636 Loopline			
Pennsylvania			
Westmoreland	1.2	Private	70, S
	1.2		38, SW
	3.2		111, E
	3.3		149, SW
	3.4		36, E
Aboveground Facilities	None identified		

Source: Supplemental Filing submitted by Atlantic and DETI, July 18, 2016.

a Includes wells within 0.25 mile of HDD sections, 500 feet of facilities in karst areas (based on Weary and Doctor, 2014) and includes the portion of ACP between MPs 60 and 154, and within 150 feet of facilities across the remaining portions of ACP and SHP.

TABLE 4.3.1-2

Springs Located near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Approximate Milepost	Distance and Direction from Workspace (feet)	Surface Drainage Direction of Spring from Project [b]
AP-1 Mainline			
West Virginia			
Harrison County	0.8	74, SW	Downgradient
	0.8	97, SW	Downgradient
	0.9	142, SW	Downgradient
	1.0	76, W	Downgradient
Lewis	9.9	3, W	Side Gradient
	10.3	Within Workspace	Side Gradient
	12.8	1, NE	Upgradient
	18.8	104, SW	Downgradient
	21.1	61, SW	Downgradient
Upshur	25.4	132, SW	Side Gradient
	26.4	10, NE	Side Gradient
	26.6	10, SW	Side Gradient
	26.8	Within Workspace	Side Gradient
	26.8	Within Workspace	Side Gradient
	26.9	Within Workspace	Side Gradient
	30.0	110, W	Side Gradient
	31.3	Within Workspace	Side Gradient
	31.5	139, NW	Upgradient
Randolph	46.4	102, W	Downgradient
	50.2	94, E	Upgradient
	50.9	33, E	Side Gradient
	51.0	Within Workspace	Side Gradient
	51.0	55, E	Side Gradient
	51.0	57, E	Side Gradient
	55.3	65, SW	Upgradient
	57.0	Within Workspace	Side Gradient
	57.0	Within Workspace	Side Gradient
	58.7	17, SW	Upgradient
	60.7	175, NE	Side Gradient
	60.7	200, E	Side Gradient
	62.0	Within Workspace	Side Gradient
	63.7	2, N	Side Gradient
	65.1	374, SW	Downgradient
	65.4	130, W	Side Gradient
	65.6	69, SW	Upgradient
	65.6	139, SW	Upgradient
	66.4	237, W	Side Gradient
	66.6	370, E	Upgradient
	66.6	120, E	Upgradient

TABLE 4.3.1-2 (cont'd)

Springs Located near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Approximate Milepost	Distance and Direction from Workspace (feet)	Surface Drainage Direction of Spring from Project [b]
Pocahontas	66.7	Within Workspace	Side Gradient
	66.7	Within Workspace	Side Gradient
	66.8	299, NW	Downgradient
	66.8	245, NW	Downgradient
	66.8	175, NW	Downgradient
	67.5	123, SW	Side Gradient
	70.5	41, E	Side Gradient
	70.8	Within Workspace	Side Gradient
	70.8	7, NW	Side Gradient
	71.9	4, SW	Downgradient
	74.8	402, W	Downgradient
	76.4	194, NE	Upgradient
	80.9	Within Workspace	Side Gradient
	82.1 [c]	62, N	Downgradient
	83.4 [c]	372, SE	Downgradient
Highland	85.4 [c]	102, N	Upgradient
	85.4 [c]	Within Workspace	Side Gradient
	85.4 [c]	102, N	Upgradient
	87.7	22, W	Side Gradient
	88.3	64, NE	Side Gradient
	88.4	120, SW	Downgradient
	89.2	Within Workspace	Side Gradient
	89.2	15, SE	Side Gradient
	90.1	36, W	Side Gradient
	90.2	Within Workspace	Side Gradient
	90.4	Within Workspace	Side Gradient
Virginia			
Bath	93.0	15, NE	Side Gradient
	93.0	201, NE	Downgradient
	93.0	80, NE	Downgradient
	93.2	Within Workspace	Side Gradient
	93.3	80, NE	Side Gradient
	93.7 [c]	55, NW	Upgradient
	101.3	Within Workspace	Side Gradient
	101.6	18, N	Side Gradient
	101.7	355, N	Downgradient
	103.1	365, N	Side Gradient
Augusta	107.5	391, NW	Side Gradient
	107.9	318, NW	Downgradient
	108.3	64, NW	Downgradient
	108.3	33, W	Side Gradient
	108.3	160, NW	Downgradient
	112.8	250, NE	Side Gradient
	112.9	455, W	Downgradient
	113.1 [c]	53, NW	Side Gradient
	123.7	56, NE	Downgradient
	123.9	51, NW	Upgradient
	123.9	Within Workspace	Side Gradient

TABLE 4.3.1-2 (cont'd)

Springs Located near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Approximate Milepost	Distance and Direction from Workspace (feet)	Surface Drainage Direction of Spring from Project [b]
	125.8	151, SW	Side Gradient
	130.8	92, E	Upgradient
	131.1	220, N	Upgradient
	131.2	271, SE	Upgradient
	140.2	425, NE	Upgradient
	144.0	147, SW	Upgradient
	144.2	315, NE	Downgradient
	146.1	70, SW	Downgradient
	146.4	11, W	Side Gradient
	151.5	442, NE	Side Gradient
	155.1 [c]	121, NW	Side Gradient
	155.2	123, N	Side Gradient
	155.5	59, NE	Upgradient
	155.9	Within Workspace	Side Gradient
	156.2	8, SE	Side Gradient
	156.4	123, E	Upgradient
	156.7	145, W	Downgradient
	157.0	Within Workspace	Side Gradient
	157.3	124, SW	Side Gradient
	157.6	305, SW	Downgradient
Nelson County	158.6	4, SW	Side Gradient
	177.5	30, S	Downgradient
Buckingham	190.3	20, NE	Side Gradient
	190.5	48, NW	Side Gradient
	198.0	18, NE	Side Gradient
	203.6	112, E	Upgradient
	208.7	48, W	Side Gradient
	208.9	Within Workspace	Side Gradient
Cumberland County	217.5	Within Workspace	Side Gradient
Brunswick	270.0	144, NE	Upgradient
	270.0	109, NE	Upgradient
	270.0	83, W	Down Gradient
AP-2 Mainline			
North Carolina			
Northampton	8.9	56, E	Downgradient
Nash	53.3	67, NW	Upgradient
Wilson	68.0	41, SE	Upgradient
Johnston	78.8	150, NW	Side Gradient
Cumberland	125.8	101, SE	Side Gradient
Robeson	164.2	148, S	Upgradient
AP-3 Lateral	None identified		
AP-4 Lateral	None identified		
AP-5 Lateral	None identified		
Aboveground Facilities	None identified		
SUPPLY HEADER PROJECT			
TL-635 Loopline			
Doddridge	2.9	58, W	Side Gradient

TABLE 4.3.1-2 (cont'd)

Springs Located near the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/State or Commonwealth/County	Approximate Milepost	Distance and Direction from Workspace (feet)	Surface Drainage Direction of Spring from Project [b]
Wetzel	30.0	107, W	Upgradient
TL-636			
Westmoreland County	1.2	63, NE	Side Gradient
Westmoreland County	3.3	39, S	Side Gradient

Source: Supplemental Filing submitted by Atlantic and DETI July 18, 2016.

[a] Includes springs within the 0.25 mile of HDD sections, 500 feet of facilities in karst areas (based on Weary and Doctor, 2014 and includes the portion of ACP between MPs 60 and 154), and 150 feet of facilities across remaining portions of ACP and SHP. Spring information is based on USGS 7.5-minute series topographic maps, discussions with landowners, civil field surveys, and biological field surveys. No springs are located within 150 feet of SHP.

[b] Surface drainage direction of a spring is evaluated from the pipeline right-of-way or project facility (e.g., access road).

[c] Located on NFS land.

Atlantic and DETI used various state environmental databases to conduct this evaluation. The PADEP maintains a web-based list of Municipal Waste Landfills and Resource Recovery Facilities and an online database for Bureau of Environmental Cleanup and Brownfields Regulated Storage Tank Cleanup Incidents (PADEP, 2014). Similarly, the WVDEP maintains a web-based list of municipal solid waste landfills and online database of leaking underground storage tanks (LUSTs) in West Virginia (WVDEP, 2013, 2014b, and 2014c). For Virginia, the VDEQ's Virginia Environmental Geographic Information System spatial database of LUSTs and other solid or hazardous waste sites in Virginia were evaluated (VDEQ, 2014b). Lastly, spatial databases from the North Carolina OneMap Geospatial Portal were reviewed to identify LUSTs, landfills, and other solid or hazardous waste sites near ACP facilities in North Carolina (NCDEQ, 2014a, 2014b, and 2014c). The results of these evaluations are summarized in table 4.3.1-3 and discussed below.

A review of the databases discussed above did not identify any contaminated sites within the search parameters for ACP or SHP facilities in West Virginia. EPA records identified three brownfield sites and four Superfund sites within 1.0 mile of ACP. One Superfund and three brownfield sites are in North Carolina near the AP-2 mainline, while three of the Superfund sites are located along the eastern extent of the proposed AP-3 lateral in industrialized areas of the City of Chesapeake, Virginia. ACP does not cross any Superfund sites.

A search for landfills and solid waste facilities identified one mixed solid waste landfill near the AP-1 mainline and one industrial landfill and two waste transfer stations within 0.5 mile of the AP-3 lateral of ACP. ACP does not cross any landfills or solid wasted facilities.

A search for LUST sites within 1,000 feet of ACP facilities identified 8 sites near the AP-1 mainline and 17 sites near the AP-3 lateral in Virginia, and 8 sites near the AP-2 mainline in North Carolina. No other known contaminated sites would be crossed by ACP.

Section 4.8.7 of this document further addresses potential impacts to and from these sites with potential contamination, as well as mitigation protocols to minimize impacts. Particular attention is given to characterization and regulatory constraints of the Borden Smith Douglass brownfield site and mitigation protocols that Atlantic would implement during construction near this site.

TABLE 4.3.1-3

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks near the Atlantic Coast Pipeline

Project/Facility/State or Commonwealth/County	Nearest Milepost	Site Name	Distance and Direction from Project (feet)	Facility Type	Surface Drainage Direction from Project	Open or Closed Status
CERCLIS and ACRES Sites Identified within 1 mile of ACP (Centerline, unless otherwise noted)						
AP-2 Mainline						
North Carolina						
Northampton	7.8	Garysburg Community Center	4,562, W [a]	Brownfield	Upgradient	Active
Halifax	10.4	Super Sturdy	2,411, W [a]	Brownfield	Downgradient	--
	11.9	Weldon Refuse Disposal	4,245, W	Brownfield	Downgradient	Active
Johnston	91.4	Hot-Z Selma Spill	3,620, NW	Superfund Site	Upgradient	Active
AP-3 Lateral						
Virginia						
Chesapeake	81.9	Money Point Creosote Site	4,109, N	Superfund Site	Downgradient	Active
	81.9	Eppinger and Russel Co Inc.	4,472, N	Superfund Site	Downgradient	Active
	82.4	Borden Smith Douglass	54, S	Superfund Site	Side Gradient	Active
RCRA Corrective Action Sites Identified within 1 mile of ACP (Centerline, unless otherwise noted)						
AP-3 Lateral						
Virginia						
Chesapeake	81.5	Royster Co.	2,437, N	RCRA Corrective Action Site	Downgradient	Closed
Formerly Used Defense Sites Identified within 1 mile of ACP (Centerline, unless otherwise noted)						
AP-3 Lateral						
Virginia						
Chesapeake	81.2	St. Julien's Creek Annex	3,000, N	FUDS Site/Superfund Site	Downgradient	Active
Landfill and Solid Waste Sites Identified within 0.5 mile of ACP (Centerline, unless otherwise noted)						
AP-1 Mainline						
Virginia						
Augusta	141.5	Jolivue Landfill/Augusta Regional Landfill	915, NE	Solid Waste Landfill Complex	Upgradient	Open
Augusta	150.2	Coal Ash Landfill	915, E	Coal Ash Landfill	Downgradient	Closed
AP-3 Lateral						
Virginia						
Southampton	19.4	SPSA-Boykins Transfer Station	451, SW	Active Waste Transfer Station	Downgradient	Open

TABLE 4.3.1-3 (cont'd)

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks near the Atlantic Coast Pipeline

Project/Facility/State or Commonwealth/County	Nearest Milepost	Site Name	Distance and Direction from Project (feet)	Facility Type	Surface Drainage Direction from Project	Open or Closed Status
	33.2	SPSA-Franklin Transfer Station	472, SW	Closed Waste Transfer Station	Upgradient	Closed
Chesapeake	81.0	Dominion Chesapeake Energy Center	317, E	Closed Industrial Landfill and Active Industrial Landfill	Side Gradient	Closed
	82.5	Atlantic Aggregate Recyclers	884, NE	Inert Landfill	Upgradient	Closed
LUST Sites within 1000 feet of ACP (Centerline, unless otherwise noted)						
AP-1 Mainline						
Virginia						
Highland	88.0	Bussard Residence	210, N	LUST	Upgradient	Closed
	115.0	VDOT – McDowell Area Headquarters	50, N	LUST	Upgradient	Closed
	115.0	VDOT – McDowell	180, N	LUST	Upgradient	Closed
Augusta	109.5	Deerfield Grocery	784, S	LUST	Downgradient	Closed
	144.2	Starkey Residence	486, SW	LUST	Side Gradient	Closed
Nelson	169.2	Ridge Crest Baptist Church	720, SW	LUST	Upgradient	Closed
Buckingham	209.2	Betty Brown Property	640, E	LUST	Upgradient	Closed
Nottoway	236.7	Childress Property	586, W [a]	LUST	Upgradient	Closed
Brunswick	275.6	Daniel Russell Residence	992, E	LUST	Side Gradient	Closed
AP-2 Mainline						
North Carolina						
Nash	49.7	NCCU-Turner Law School	840, SW [a]	LUST	Side Gradient	Closed
	49.7	NCCU-Eagleson Hall	270, W	LUST	Downgradient	Closed
Johnston	109.0	Tippet Residential	616, SE [a]	LUST	Downgradient	Closed
Sampson	118.7	Plain View Grocery	965, SE	LUST	Upgradient	Open
Cumberland	126.3	McIntyre's Exxon	895, SE	LUST	Upgradient	Closed
	126.4	Godwin Grocery	729, SE	LUST	Upgradient	Closed
	145.1	Stricklands 2	538, E	LUST	Side Gradient	Closed
Robeson	182.7	Rudy's Restaurant	805, SW	LUST	Downgradient	Open
AP-3 Lateral						
Virginia						
Southampton	23.6	Cooke Betty M Residence	889, NW	LUST	Upgradient	Closed
Suffolk	45.5	Williamson Callie Residence	931, S	LUST	Side Gradient	Closed
	45.5	Williamson Callie Residence	881, S	LUST	Side Gradient	Closed

TABLE 4.3.1-3 (cont'd)

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks near the Atlantic Coast Pipeline

Project/Facility/State or Commonwealth/County	Nearest Milepost	Site Name	Distance and Direction from Project (feet)	Facility Type	Surface Drainage Direction from Project	Open or Closed Status
	52.8	Truck Stop West Amoco	704, E [a]	LUST	Side Gradient	Closed
Chesapeake	78.6	Deep Creek Pharmacy	160, SW	LUST	Downgradient	Closed
	78.8	Mid Atlantic Repair Inc.	535, S	LUST	Downgradient	Closed
	78.8	Watkins Motor Lines, Inc.	363, S	LUST	Downgradient	Closed
	80.1	Deep Creek Pumping Station	725, N	LUST	Up or Side Gradient	Closed
	81.2	IMTT – Chesapeake Terminal	626, NW	LUST	Upgradient	Closed
	81.5	Chesapeake Energy Center	706, S	LUST	Up or Side Gradient	Closed
	81.6	Chesapeake Energy Center	755, S	LUST	Up or Side Gradient	Open
	81.6	Chesapeake Energy Center	737, S	LUST	Up or Side Gradient	Closed
	81.6	Chesapeake Energy Center	724, S	LUST	Up or Side Gradient	Closed
	81.7	Chesapeake Energy Center	853, S	LUST	Up or Side Gradient	Closed
	82.0	OneSteel Recycling Inc.	899, N	LUST	Up or Side Gradient	Closed
	82.1	Smith Douglas Plant Former	431, S	LUST	Up or Side Gradient	Closed
	82.4	Quest Transport LLC	304, S	LUST	Downgradient	Closed

No contaminated sites, landfills, or LUST sites were found within the search distances identified above for SHP.

[a] Distance from Access Road.

[b] Distance from Construction Yard.

[c] Distance from Aboveground Facility.

4.3.1.7 Groundwater Impacts and Mitigation

Activities associated with pipeline and aboveground facility construction have the potential to affect groundwater in different ways. Surface drainage and groundwater recharge patterns can be temporarily altered by clearing, grading, trenching, and soil stockpiling activities, potentially causing minor fluctuations in groundwater levels and/or increased turbidity, particularly in shallow surficial aquifers. Additionally, soil compaction caused by heavy construction vehicles can reduce infiltration and increase surface runoff and ponding. These impacts would be minimized or avoided through implementation of the FERC *Plan* and *Procedures* along with the measures outlined in Atlantic's and DETI's construction and restoration plans.

Construction of pipelines and aboveground facilities would generally be confined to depths of 10 feet or less, which is generally above bedrock aquifer depths and the water table of surficial aquifers crossed by ACP and SHP. Shallow surficial aquifers are typically comprised of relatively permeable alluvial sands and gravels that respond rapidly to changes in water level elevations or groundwater flow. Changes in water levels and/or turbidity in shallow aquifers from pipeline construction activities tend to be localized and temporary since water levels quickly re-establish equilibrium and turbidity levels rapidly subside. Atlantic and DETI would avoid or minimize groundwater impacts by implementing construction techniques described in their construction and restoration plans, such as using temporary and permanent trench plugs and interceptor dikes. Following construction, Atlantic and DETI would restore the ground surface to original contours as closely as practicable and restore vegetation on the right-of-way to establish surface drainage and recharge conditions as closely as possible to those prior to construction.

Hazardous or toxic materials and fluids used on the right-of-way during construction are typically limited to fuels, oils, lubricants, hydraulic fluids, and explosives for blasting, where required. To avoid or limit releases of these materials into the environment, they would be handled in accordance with the company's *SPCC Plan* and *Blasting Plan*. Additionally, Atlantic and DETI would implement the FERC *Plan* and *Procedures* and comply with state and local discharge permits to minimize and mitigate potential impacts on surficial aquifers during hydrostatic testing discharge and trench dewatering activities.

Water Use and Quality

Prior to construction and pending landowner authorizations, Atlantic and DETI would test water supply wells and springs within 150 feet of the construction workspace (within 500 feet of the construction workspace in karst terrain). In addition to well yields, water quality parameters that would be tested include pH, total suspended solids, total dissolved solids, conductivity, alkalinity, acidity, sulfates, oil/grease, phenolic, iron, manganese, aluminum, copper, lead, nickel, silver, thallium, zinc, chromium, arsenic, mercury, selenium, cyanide, calcium magnesium, hardness, chlorides, antimony, cadmium, beryllium, and fecal coliform. Sampling methods would comply with approved EPA and state/commonwealth sampling, analytical and data quality assurance, and quality control procedures. The samples would be analyzed using EPA-approved methods, and the analysis would be performed by a laboratory certified to conduct the analyses in each state/commonwealth.

The preconstruction water source tests described above would provide baseline information to determine whether construction activities have adversely affected water sources. If a damage claim is filed with Atlantic or DETI, Atlantic and DETI would conduct post-construction water quality tests, which would be analyzed by a certified laboratory, to determine if water supply wells and springs were affected by construction activities. If damage occurred, Atlantic and DETI have committed to providing a temporary potable water source, and/or a new water treatment system or well.

Atlantic and DETI have proposed to conduct post-construction well testing only if a damage claim is filed; however, to ensure that all water supply wells and springs are not damaged by construction, **we recommend that:**

- **Atlantic and DETI should offer to conduct, with the landowner's permission, <u>post-construction</u> water quality tests, using the same parameters used in the preconstruction tests, for all water supply wells and springs within 150 feet of the construction workspace and within 500 feet of the construction workspace in karst terrain.**

We received numerous comments that wells and springs that are more than 500 feet from the construction workspace in karst terrain may be temporarily or permanently affected by construction activities, and that the preconstruction well and spring survey distance should be increased. A karst specialist would be employed to determine if construction activities could have an impact on the seeps and/or springs. Atlantic and DETI would implement the karst avoidance and mitigation measures identified in section 4.1.2.3 to minimize impacts on karst systems, and would implement the measures identified in the following sections to further minimize impacts on wells and springs. Further, the results of the fracture trace and combined existing dye trace analysis discussed in section 4.1.2.3 would aid in determining groundwater receptors beyond the 500-foot preconstruction survey distance that could potentially be impacted by construction. Wells and/or springs directly downgradient of or in the flow path of identified lineaments would be evaluated for testing. We encourage anyone who believes their well or spring may be affected by construction of the proposed projects to specifically request a preconstruction water quality and yield survey. Should construction activities affect a well or spring, landowners can negotiate the delivery of alternative water supplies and/or water sources with Atlantic/DETI. If Atlantic and DETI are unresponsive or unwilling to negotiate, we encourage landowners to contact FERC's Landowner Helpline to investigate the problem.

Atlantic and DETI have committed to route around septic systems and the associated leach fields, if possible. If impacts cannot be avoided, Atlantic and DETI would work with the landowners to relocate the existing septic system and would compensate the landowner for associated costs and for loss of usable land.

Karst Groundwater

Karst development greatly increases the susceptibility of underlying aquifers to contamination sources (e.g., stormwater runoff, chemical spills, or other contaminants) originating at the ground surface. Where mature karst surface topography is developed, there is a discernable lack of perennial surface streams, as water is lost rapidly to the subsurface network of karst conduits; as such, karst areas are susceptible to a greater range of environmental impact.

In karst areas, dual methods exist for groundwater recharge. Significant volumes of recharge waters originate as gaining streams in upland, non-karstic areas and recharge lower-lying karst groundwater system through swallets or infiltration through valley-train deposits (alluvium) along stream beds (allogenic recharge); recharge also occurs within karst terrain by autogenic means or direct infiltration of recharge waters through overburden soils/alluvium or funneled through swallets or sinkholes/sinkhole depressions. Water originating in upland areas drain toward lower-lying karst terrain and provide a continuum of recharge from diffuse recharge through the soil overburden through discrete recharge directly into sinkholes and swallets. Surface water flowing through karst openings such as swallets has little opportunity to be naturally filtered by sediment as water rapidly flows through karst conduits. Groundwater flow through a mature karst system of conduits is rapid and often turbulent, and discharge is normally manifested at perennial springs and surface waterbodies that are hydraulically downgradient and connect with the subterranean karst network.

Atlantic and DETI conducted detailed desktop assessments and field surveys along karst prone portions of ACP and SHP to identify sinkholes and other karst features (see section 4.1.2.3). As discussed in section 4.1.2.3, Atlantic has committed to completing a fracture trace/lineament analysis utilizing remote sensing platforms (aerial photography and LiDAR), coupled with results of existing dye trace studies to define areas/zones of concentrated karst development and to evaluate groundwater flow conditions between workspaces and area receptors. Further, as recommended in section 4.3.1.5, Atlantic and DETI would be required to complete well and spring surveys in karst terrain, and would conduct preconstruction and post-construction surveys of water supply wells and springs, if requested by the landowner.

Atlantic and DETI would adhere to the mitigation procedures presented in the *Karst Mitigation Plan*. Measures identified in the *Karst Mitigation Plan* in combination with the mitigation measures for construction through karst areas identified in section 4.1.2.3, are designed to prevent or minimize impact to karst groundwater resources include:

- installation of erosion and sediment controls along the edge of the construction right-of-way and in other work areas upslope of known sinkholes or other karst features, and, if necessary, implement minor route adjustments;

- earth disturbing activities would be conducted in a manner that minimizes alteration of existing grade and hydrology of existing surficial karst features. Land disturbances, including permanent filling, excavating, or otherwise altering existing karst features, or any of these activities within 300 feet of a feature, would be avoided where possible, or minimized;

- recharge areas of cave streams and other karst features would be protected by following relevant conservation standards pertaining to stream and wetland crossings, as well as spill prevention, containment, and control;

- existing open conduits developed in karst terrain that intersect the ground surface would not be used for the disposal of water;

- construction stormwater would be detained, diverted, or containerized to prevent it from flowing to karst features, and drainage points in karst features would not be used for water disposal;

- in linear excavations adjacent to karst features, spoil from the trench would be placed on the upslope side of the excavation so that if any erosion takes place, the stockpiled soil would flow back in the excavation and not down-slope towards the karst feature;

- to avoid or minimize the potential impact of hazardous material spills during construction and operation of ACP, Atlantic would implement the measures in its *SPCC Plan* (see table 2.3.1-1), which would prevent fueling and prohibit overnight parking and the storage of hazardous materials, chemicals, fuels, lubricating oils, and petroleum products within 300 feet of any karst features;

- discharge of hydrostatic test water directly into the buffer zone of a karst feature would be prohibited. If site conditions prevent down-slope discharge, the water would be discharged as far as is practicable from the buffer zone using a filtered discharge and erosion and sediment control measures in accordance with the FERC *Plan*. Restoration and revegetation of these areas would occur after construction; and

- Atlantic would not use HDD methods in karst terrain.

Using a geologist or engineer with experience in karst, Atlantic and DETI would conduct a final preconstruction field assessment of seeps and springs within 500 feet of construction workspaces in karst terrain. The karst specialist would determine if construction activities could have an impact on the seeps and/or springs, and provide recommended construction alternatives to avoid impacts as applicable.

We received comments regarding the potential for construction activities (e.g., trenching and grading) to intercept subterranean streams and "behead" water sources. Given the relatively shallow depth of the excavation required for pipeline installation, and the fact that attempts would be made to avoid intersecting karst conduits, the likelihood of intercepting a saturated karst conduit is very low. However, for an operational pipeline to impede groundwater flow, the pipe would have to encompass an area within the aquifer that extends both vertically and laterally to impermeable barriers (i.e., it would have to 'seal off' the aquifer). Otherwise, groundwater would just flow around the pipe. An aquifer's thickness and lateral extent varies, but is regardless much greater than the space that would be occupied by the pipelines proposed for the projects. The physical pipeline would occupy only a negligible portion of the aquifer and have no influence on groundwater flow. Hydraulic head, or the level to which water rises in a well, is a measurement of the potential energy of water due to its elevation and additional energy from pressure (Pennsylvania State University, 2016). Due to the relatively small pipeline trench relative to the larger aquifer system in which it traverses through, the pipeline trench would have no influence on groundwater elevation or the water's potential energy associated with pressure. Therefore, a pipeline or pipeline trench would not influence local groundwater's hydraulic head and therefore would not alter groundwater flow.

Similarly, because of the pipeline's size relative to the aquifer and the fact that it would not be attached to an impermeable barrier above the aquifer, water infiltration would not be inhibited by the presence of a pipeline. The rights-of-way and subsurface pipe would only overlie a very small portion of the aquifers crossed. Further, rights-of-way would be restored to preconstruction contours and either seeded or allowed to revegetate naturally. For these reasons, the projects' restored rights-of-way would not cause a permanent reduction to infiltration of recharge waters.

Upon completion of construction, Atlantic and DETI would restore the ground surface as closely as practicable to original contours, and re-establish vegetation to facilitate restoration of preconstruction overland water flow and recharge patterns. Atlantic and DETI would minimize impacts by implementation of the construction practices and operational erosion controls outlined in the FERC *Plan* and *Procedures*.

Contamination and Accidental Spills of Hazardous Materials

An inadvertent release of fuel, lubricants, and other substances could impact groundwater quality. The degree of impact would depend on the type, amount, and duration of material released; the type of soil or geologic material at the land surface; the depth to groundwater; and the characteristics of the underlying aquifer. If not cleaned up, soils contaminated by spilled materials could leach pollutants into groundwater over time. While surficial aquifers beneath the project route would be most susceptible to impacts, there is also potential for contaminants to migrate into deeper aquifers, which can occur very quickly given the fast transport times that may result from water flow through open conduits.

Atlantic and DETI have prepared a *SPCC Plan* to avoid or minimize impacts of hazardous material releases during construction and operation of ACP and SHP. The *SPCC Plan* prescribes preventive measures such as regular inspection of storage areas for leaks, replacement of deteriorating containers, and construction of secondary containment systems around hazardous liquids storage facilities. Moreover, the

SPCC Plan provides explicit guidance on handling hazardous materials during construction. Specifically, it would restrict refueling or other liquid transfer areas within 100 feet of wetlands, waterbodies, and springs, and within 300 feet of karst; prohibit refueling within 200 feet of private water supply wells and within 400 feet of municipal water supply wells; and require additional precautions (e.g., secondary containment) when specified setbacks cannot be maintained. The *SPCC Plan* also prescribes emergency response procedures, equipment, and cleanup measures to be implemented in the event of a spill, and establishes strict handling, inventory requirements to be followed by the construction contractor. In addition, Atlantic and DETI would evaluate recommended measures provided by local agencies where wellhead protection or groundwater protection areas are crossed.

Atlantic and DETI would employ EIs to ensure compliance with the *SPCC Plan*, the FERC *Plan* and *Procedures*, and other construction and restoration plans during construction and restoration. The EIs would have the authority to stop work and order corrective actions for activities that violate any permit conditions.

It is possible that previously undocumented sites with contaminated soils or groundwater could be discovered during construction of ACP and SHP. Atlantic and DETI would implement a *Contaminated Media Plan* (see table 2.3.1-1) to address these circumstances. The *Contaminated Media Plan* presents procedures for detecting, excavating, stockpiling, characterizing, and determining the disposition of potentially contaminated soils and groundwater, along with measures to avoid or minimize the spread of contaminants. Signs of potential contamination could include discoloration of soil, chemical-like odors, or sheens on soils or water. Containment measures would be implemented to isolate and contain the suspected soil or groundwater contamination and collect and test samples of the substrate or groundwater to identify the contaminants. Once the contaminants are identified, and the magnitude of the contamination is determined, a response plan would be developed for crossing or avoiding the site. Atlantic and DETI would complete post-construction water quality test for water supply wells and springs within 500 feet of encountered contaminants.

Blasting

Blasting may be required for portions of ACP and SHP where lithic bedrock is present at or within the trench depth. Atlantic and DETI have prepared and would implement a *Blasting Plan* (see table 2.3.1-1) that prescribes procedures for the use, storage, and transportation of explosives, and is consistent with federal, state/commonwealth, and local agency regulations. Where blasting is necessary, it would be conducted in a manner to minimize possible impacts on nearby public and private water supply wells, springs, or karst features. Moreover, Atlantic and DETI would implement controlled blasting using small localized detonations and low-force charges that are designed to transfer the explosive force only to the rock that is designated for removal.

As discussed above, Atlantic and DETI would contact landowners to determine the location of private water wells and water supply springs within 500 feet of the proposed pipelines in karst areas and within 150 feet of approved construction workspaces along the remainder of the route, including near locations where blasting may be required. Pending landowner permission, preconstruction well testing would be conducted to evaluate water quality and yield. If construction has adversely impacted the water quality and/or yield of a well, Atlantic and DETI would provide a temporary or permanent alternative water source depending on the type and degree of impact.

Aboveground Facilities

The aboveground facilities, proposed compressor facilities, access roads, and contractor yards would be in the same general vicinity as the pipeline facilities discussed above. The measures proposed to minimize the potential impacts of the pipeline on groundwater (e.g., adherence to the measures included in the FERC *Plan* and *Procedures* and *SPCC Plan*) would apply to these areas as well. Additionally, although some clearing and grading activities may be associated with the contractor yards and access roads, trenching and drilling would not take place in these areas, thereby reducing the potential for impact. Additionally, excavation associated with the compressor facilities is expected to be less than 6 feet deep. For these reasons, we do not expect the construction or use of the aboveground facilities, access roads, and contractor yards to impact groundwater resources.

Operation Impacts

Although the natural gas received by ACP and SHP would be processed to remove natural gas liquids (NGL), small amounts of residual NGLs may still be present in the gas. Standard operating procedures minimize the risk of release of residual NGLs that may accumulate in the pipeline, including construction design and adherence to DOT regulations, monitoring of the pipelines to ensure gas quality parameters are met at the receipt point, installing filter separators at receipt points and compressor stations, and pigging the pipeline to remove fluids from the pipeline in a controlled manner. Additionally, in the unlikely event of an inadvertent NGL release, Atlantic and DETI would implement the *SPCC Plan*, and have spill kits staged at work locations where trained employees and contractors are able to ensure that compliance and safety requirements are met during the spill cleanup process.

4.3.1.8 Groundwater on Federal Lands

No sole source or state designated aquifers, WHPAs, water supply wells, or potential sources of groundwater contamination have been identified along the portion of the AP-1 mainline that crosses the MNF, GWNF, or the BRP. However, two springs were identified near ACP within the MNF, with an additional spring within 0.1 mile of the MNF. Six springs were identified within the GWNF (see table 4.3.1-2). No water quality data have been presented to date on the existing condition of these springs. Depending on their location and proximity to the right-of-way construction and maintenance areas, there is potential to adversely impact groundwater through accidental spills, increased stormwater runoff, or alteration of recharge patterns. In addition, on the GWNF there are numerous seeps that were identified during field surveys. No water quality data have been presented to date on the existing condition of these seeps. Depending on their location and proximity to the right-of-way construction and maintenance areas, there is potential to adversely impact groundwater at these locations. However, implementation of the construction, mitigation, and monitoring procedures described above would avoid or minimize groundwater impacts on federal lands.

The proposed AP-1 mainline crosses 1.4 miles of karst terrain on the GWNF. See section 4.1.6 for our more detailed discussion on karst impacts on NFS lands. Implementation of the mitigation procedures described in section 4.1.2.3 and appendix I along with Atlantic's construction and restoration plans would avoid or minimize impacts on karst features on federal lands.

4.3.1.9 Conclusion

No long-term impacts on groundwater are anticipated from construction or operation of ACP and SHP because disturbances would be temporary, erosion controls would be implemented, natural ground contours would be restored, and the right-of-way revegetated. Implementation of the FERC *Plan* and *Procedures*, the projects' *Karst Mitigation Plan, Restoration and Rehabilitation Plan, Blasting Plan, SPCC Plan*, *Stormwater Pollution Prevention Plans*, *Slope Stability Policy and Procedures*, and *Fugitive Dust Control and Mitigation Plan* would limit any impacts from construction on groundwater resources. Temporary, minor, and localized impacts could result during trenching activities in areas with shallow groundwater (depth less than 10 feet below the ground surface) crossed by the pipeline. The greatest threat posed to groundwater resources would be during construction through mature karst terrain and from a hazardous material spill or leak into groundwater supplies. Implementing the strategies and methods presented in the *SPCC Plan* and the *Karst Mitigation Plan* would prevent or limit such contamination should a spill occur. We do not anticipate any significant impacts on aquifers by ACP and SHP, given their depth and the relatively shallow nature of construction.

Operation of the proposed pipelines and aboveground facilities is not likely to impact groundwater use or quality under typical operating conditions. A possible exception to this would be if maintenance activities require excavation or repair in proximity to water supply wells or springs. In such a case, the impacts and mitigation would be similar to those described above for construction activities. Where wells or springs are within the maintenance construction footprint, Atlantic and DETI would coordinate with landowners to avoid or mitigate impacts on these features.

4.3.2 Surface Water Resources

Surface waters include rivers, streams, creeks, lakes, ponds, and ditches that support or may support multiple public uses including drinking water, recreation, fish and wildlife habitat, and industrial and agricultural production. These surface water resources are managed and protected on national, state, and local levels. Wetlands are discussed in section 4.3.3.

Waterbodies are defined by the FERC as "any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as lakes and ponds." Waterbodies may be characterized as having perennial, intermittent, or ephemeral flow. Perennial waterbodies contain water for all or most of the year. Intermittent waterbodies flow seasonally or following rainfall events. Ephemeral waterbodies flow only during or shortly after precipitation events or spring snowmelt. We also define waterbodies as major, intermediate, and minor based on the width of the water crossing at the time of construction. Major waterbodies are those that are greater than 100 feet wide, intermediate waterbodies are greater than 10 feet wide but less than or equal to 100 feet wide, and minor waterbodies are those that are less than or equal to 10 feet wide.

4.3.2.1 Existing Watersheds

Watersheds are basin-like landforms defined by highpoints and ridgelines that descend into lower elevations and stream valleys. Watersheds collect water from their basin and drain to a common outlet point. Information on the watersheds and sub-basins crossed by ACP and SHP is summarized in table 4.3.2-1.

4.3.2.2 Existing Surface Water Resources

Field Survey Summary

Atlantic and DETI identified surface water resources crossed by the projects during environmental field surveys conducted in 2014, 2015, and 2016. Where survey permission has not been granted by the landowner, surface waters were identified from USGS topographic maps, aerial photography, and other GIS-based information. Table 4.3.2-2 provides a summary of the surface waters crossed by ACP and SHP; some waterbodies are crossed more than once.

Appendix K provides a detailed list of the 1,536 and 133 waterbodies crossings within the ACP and SHP workspace, respectively, and includes location (milepost or facility), waterbody name, flow regime, crossing width, and crossing method (see section 2.3.3 for a detailed description of crossing methods); some waterbodies are crossed more than once. Where applicable, state water quality classifications, anticipated timing restrictions, potential for blasting, proposed water appropriations, and any impairment or sensitivity are also included. Section 4.3.2.4 provides information on state classifications, and section 4.6 provides information on protected fisheries and aquatic resources.

TABLE 4.3.2-1

Watersheds Crossed by the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Regional Watershed/Sub-Region	Approximate Mileposts	County/City and State/Commonwealth	Hydrologic Unit Code (HUC) 8/ Sub-basin Name
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
Ohio Regional Watershed			
Monongahela	0.0 – 56.2 and 64.6 – 66.1	Harrison, Lewis, Upshur, and Randolph Counties, WV	05020002/West Fork 05020001/Tygart Valley
Kanawha	56.2 – 64.6 and 66.1 – 83.9	Randolph and Pocahontas Counties, WV	05050007/Elk 05050003/Greenbrier
Mid-Atlantic Regional Watershed			
Lower Chesapeake (James)	83.9 – 118.1 and 158.2 – 247.3	Highland, Bath, Augusta, Nelson, Buckingham, Cumberland, Prince Edward and Nottoway Counties, VA	02080201/Upper James 02080202/Maury 02080203/Middle James - Buffalo 02080205/Middle James – Willi 02080207/Appomattox
Potomac	118.1 – 158.2	Augusta County, VA	02070005/South Fork Shenandoah
Atlantic-Gulf Regional Watershed			
Albermarle-Chowan	247.3 – 300.2	Nottoway, Dinwiddie, Brunswick, and Greensville Counties, VA, and Northampton County, NC	03010201/Nottoway 03010204/Meherrin
AP-2 Mainline			
Atlantic-Gulf Regional Watershed			
Albermarle-Chowan	0.0 – 4.6	Northampton and Halifax Counties, NC	03010204/Meherrin
Roanoke	4.6 – 18.0	Northampton, Nash, and Halifax Counties, NC	03010107/Lower Roanoke
Neuse-Pamlico	18.0 – 115.3	Halifax, Nash, Wilson, Johnston, and Sampson Counties, NC	03020102/Fishing 03020101/Upper Tar 03020203/Contentnea 03020201/Upper Neuse
Cape Fear	115.3 – 159.3	Sampson and Cumberland Counties, NC	03030006/Black 03030004/Upper Cape Fear 03030005/Lower Cape Fear
Pee Dee	159.3 – 183.0	Cumberland and Robeson Counties, NC	03040203/Lumber
AP-3 Lateral			
Atlantic-Gulf Regional Watershed			
Albermarle-Chowan	0.0 – 53.0 and 71.3 – 71.7	Northampton County, NC, Southampton County, VA and City of Suffolk and City of Chesapeake, VA	03010204/Meherrin 03010201/Nottoway 03010202/Blackwater 03010203/Chowan 03010205/Albemarle
Mid-Atlantic Regional Watershed			
Lower Chesapeake (James)	53.0 – 71.3 and 71.7 – 82.7	City of Suffolk and City of Chesapeake, VA	02080208/Hampton Roads
AP-4 Lateral			
Atlantic-Gulf Regional Watershed			
Chowan-Roanoke	0.0 – 0.4	Brunswick County, VA	03010204/Meherrin

TABLE 4.3.2-1 (cont'd) **Watersheds Crossed by the Atlantic Coast Pipeline and Supply Header Project**			
Pipeline Segment/Regional Watershed/Sub-Region	Approximate Mileposts	County/City and State/Commonwealth	Hydrologic Unit Code (HUC) 8/ Sub-basin Name
AP-5 Lateral			
Atlantic-Gulf Regional Watershed			
Chowan-Roanoke	0.0 – 1.1	Greensville County, VA	03010204/Meherrin
SUPPLY HEADER PROJECT			
TL-635 Loopline			
Ohio Regional Watershed			
Monongahela	0.0 – 0.6	Harrison County, WV	05020002/West Fork
Upper Ohio	0.6 – 33.6	Doddridge, Tyler, and Wetzel Counties, WV	05030201/Little Muskingum – Middle Island
TL-636 Loopline			
Ohio Regional Watershed			
Monongahela	0.0 – 3.9	Westmoreland County, PA	05020005/Lower Monongahela

Source: USGS, 1994

The major waterbodies crossed by ACP are identified in table 4.3.2-3. No major waterbodies would be crossed by SHP. Atlantic has submitted site-specific drawings for all the major waterbodies crossed by the pipeline. However, some of the major waterbody crossing design specifications and crossing locations have changed since the most recent site-specific drawings were submitted, and site-specific construction and restoration measures have not been incorporated into the plans. Therefore, **we recommend that**:

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, updated site-specific crossing plans for major waterbody crossings. The plans should include, as necessary, the location of temporary bridges and bridge type, appropriate cofferdam locations, water discharge structure locations, pump locations, and agency-imposed TOYR and construction and restoration requirements.**

Aboveground Facilities

On ACP, six waterbodies are present at the Compressor Station 1 site. Hollick Run would be temporarily impacted by the installation of pipeline. The five remaining waterbodies at the Compressor Station 1 site would not be impacted. At the Compressor Station 2 site, an unnamed tributary to Ripley Creek would be temporarily impacted by the installation of the pipeline across two segments of the waterbody where the pipeline enters the station site. A tributary to the Cape Fear River at the Fayetteville M&R Site would be temporarily impacted by the installation of the pipeline. No other waterbodies are present at aboveground facility sites.

There are two waterbodies present at DETI's Mockingbird Hill Compressor Station, and three at the JB Tonkin Compressor Station; however, none of these waterbodies would be impacted by the upgrades at these stations.

TABLE 4.3.2-2

Surface Waters Crossed by the Atlantic Coast Pipeline and Supply Header Project

Project/Facility	Waterbody Type: Perennial	Intermittent	Ephemeral	Canal/ Ditch	Open Water Ponds/ Reservoirs [b]	FERC Classification [a]: Major	Intermediate	Minor [b]	Open Water Ponds / Reservoirs [c]
ATLANTIC COAST PIPELINE									
Pipeline Facilities	514	469	164	46	48	18	208	970	46
Aboveground Facilities	4	4	0	0	0	0	2	6	0
Access Roads	67	144	60	2	0	0	49	224	0
Pipe Storage and Contractor Yards	2	5	2	1	0	0	2	8	0
Ground Beds	0	2	2	0	0	0	0	3	0
ACP Subtotal	*587*	*624*	*228*	*49*	*48*	*18*	*261*	*1,211*	*46*
SUPPLY HEADER PROJECT									
Pipeline Facilities	56	9	0	0	0	0	24	41	0
Aboveground Facilities	4	1	0	0	0	0	1	4	0
Access Roads	54	8	0	0	0	0	17	45	0
Pipe Storage and Contractor Yards	0	0	0	0	0	0	0	0	0
Ground Beds	1	0	0	0	0	0	0	1	0
SHP Subtotal	*115*	*18*	*0*	*0*	*0*	*0*	*42*	*91*	*0*
ACP and SHP Total	**702**	**642**	**228**	**49**	**48**	**18**	**303**	**1,302**	**46**

a Based on Ordinary High Water Mark (OHWM) obtained during field surveys or desktop review. Waterbodies with an OHWM of 10 were classified as intermediate. Where the OHWM was not provided for a waterbody crossing (see appendix K), the access road or workspace crossing length was utilized to determine the waterbody classification. Wetland-waterbody complex crossings, which do not have a defined bed or bank, identified in appendix K are not included in this table.

b Minor crossings include canal/ditch crossings.

c The Open Water Pond/Reservoirs category total for Pipeline Facilities and Project Total on ACP is different between Waterbody Type and FERC Classification because two reservoir crossings (Prince Lake at AP-3 MP 61.0, and Western Branch Reservoir at AP-3 MP 62.4) are classified as "major" crossings.

TABLE 4.3.2-3 **Major Waterbodies Crossed by the Atlantic Coast Pipeline**				
Pipeline Segment/County or City/State or Commonwealth	Waterbody Name	Milepost	Approximate Crossing Width (feet)	Proposed Crossing Method
AP-1 Mainline				
Pocahontas County, WV	Greenbrier River	76.6	180	Cofferdam
Bath County, VA	Cowpasture River [a]	97.8	106	Cofferdam/Dam and Pump
Nelson and Buckingham Counties, VA	James River (includes Mayo Creek)	184.6	396	HDD
Cumberland and Prince Edward Counties, VA	Appomattox River	220.7	106	Cofferdam
Greensville County, VA	Meherrin River	286.3	183	Cofferdam
AP-2 Mainline				
Northampton and Halifax Counties, NC	Roanoke River	9.9	355	HDD
Halifax and Nash Counties, NC	Fishing Creek [b]	33.9	104	HDD
Nash County, NC	Swift Creek	40.6	126	HDD
Nash County, NC	Tar River	59.4	159	HDD
Johnston County, NC	Neuse River	98.5	138	Cofferdam
Cumberland County, NC	Cape Fear River	154.2	326	HDD
AP-3 Lateral				
Greensville and Southampton County, VA	Meherrin River	12.4	147	Cofferdam
Southampton, VA	Nottoway River	32.6	241	HDD
Southampton County and City of Suffolk, VA	Blackwater River	38.6	208	HDD
City of Suffolk, VA	Lake Prince	61.0	389	HDD
City of Suffolk, VA	Western Branch Reservoir	62.4	302	HDD
City of Suffolk, VA	Nansemond River	64.4	460	HDD
City of Chesapeake, VA	South Branch Elizabeth River	81.8	836	HDD

[a] The OHWM for Cowpasture River is 90 feet, which qualifies it as an intermediate waterbody, but it is included here because a site-specific plan for the crossing is required by the FERC.

Contractor Yards

Ten waterbodies are within proposed contractor yard sites for ACP (none are present at SHP yards); however, none of these features would be impacted. Atlantic has committed to maintaining a 5-foot buffer around each waterbody. Additionally, site-specific sediment and erosion control plans would be developed for each contractor yard to ensure waterbodies are protected from impacts. Protection of wetlands and waterbodies would be achieved by implementing the BMPs identified in Atlantic's construction and restoration plans, site-specific *Stormwater Pollution Prevention Plans* (*SWPPP*s), and in accordance with state/commonwealth construction stormwater permit programs.

Access Roads

Access roads for ACP would cross 274 waterbodies (some waterbodies are crossed more than once), including 49 intermediate and 224 minor waterbodies. Of these features, 67 are perennial, 144 are intermittent, 60 are ephemeral, and 2 are canals/ditches (see table 4.3.2-2). Access roads for SHP would cross 17 intermediate and 41 minor waterbodies (some waterbodies are crossed more than once). Of these features, 54 are perennial and 8 are intermittent. Some access roads may be used in their present condition without modifications or improvements, while others would require modifications such as culvert installation, replacement, or repair; or the installation of new bridges or improvements to existing bridges.

Access road types, waterbody crossing locations, and anticipated improvements/modifications are provided in appendix K.

Cathodic Protection Systems

Atlantic and DETI are proposing to install 20 cathodic protection systems along ACP and 4 along SHP, typically adjacent to road crossings (see section 2.1.2.5). Four minor waterbodies (two intermittent and two ephemeral) on ACP, and one perennial, minor waterbody on SHP would be crossed by cathodic protection systems, as follows:

- an intermittent and ephemeral unnamed tributary to Big Branch near AP-2 MP 84.6 on ACP;
- an ephemeral unnamed tributary to Saddletree Swamp near AP-2 MP 172.4 on ACP;
- an unnamed tributary to Darden Pond near AP-3 MP 24.2 on ACP; and
- a perennial unnamed tributary to Little Battle Run near TL-635 MP 17.8 on SHP.

Cathodic protection ground beds consist of a series of anodes that are buried vertically in the ground approximately 12 feet deep and spaced approximately 15 feet apart. The anodes are connected by an anode header cable that connects the anodes to the cathodic protection system and the pipeline. The waterbody crossings would consist of trenching across the waterbodies to install the anode header cable, which would maintain a minimum ground cover of 30 inches of native soil backfilled over the cable. The cable would be installed across the waterbodies by digging a shallow trench to install the anode header cable. The construction right-of-way at the crossing would typically be 25 feet wide.

Impacts associated with trenching across the waterbodies to install the anode header cable would be short term and temporary. Clearing and grading of stream banks, in-stream trenching, and backfilling could each result in temporary, local modifications of aquatic habitat involving sedimentation, increased turbidity, and decreased dissolved oxygen concentrations if water is present at the time of the crossing. These impacts would be limited to the period of in-stream construction, and environmental conditions would return to normal shortly after stream restoration activities are completed.

The waterbodies crossed by the cathodic protection ground beds on ACP are either ephemeral or intermittent, measuring 5 feet or less in width. If perceptible flow is present at the time of construction, Atlantic would evaluate use of the flume or dam and pump dry crossing methods to install the anode header cable. SHP ground bed would cross a perennial waterbody that is less than 5 feet wide. DETI would use a dry crossing method to install the anode header cable to minimize in-water impacts.

4.3.2.3 Designated Flood Zones

FEMA defines flood zones at varying levels based on flood risk and type of flooding. Special Flood Hazard Areas (SFHAs) are those that are subject to inundation by a 1-percent-annual chance, or a 100-year flood. FEMA also defines areas of minimal flood hazard that are within the 0.2-percent-annual chance, or a 500-year flood (FEMA, 2016).

Based on review of FEMA flood hazard maps, ACP pipeline facilities would cross 41.3 miles of land within SFHAs and 5.2 miles of land within minimal flood hazard areas. In addition, portions of Compressor Station 1 site, portions of eight contractor yards, and the Fayetteville and Pembroke M&R

stations would be within SFHAs. Of the eight proposed contractor yards, five are also within minimal flood hazard areas.

SHP pipeline facilities would cross 1.0 mile of SFHAs and less than 0.1 mile of minimal flood hazard area. Portions of the JB Tonkin Compressor Station are in an SFHA and a minimal flood hazard area, and portions of four contractor yards would be within SFHAs.

4.3.2.4 Surface Water Beneficial Uses and State Classifications

Each of the states/commonwealths crossed by ACP and SHP have developed its own regulatory system for evaluating, classifying, and monitoring the quality and uses of surface waters. Each system includes the assignment of "beneficial use designations" that describe the potential or realized capacity of a waterbody to provide defined ecological and human population benefits. A summary of the beneficial use designations for each state/commonwealth is provided below. The state/commonwealth classifications for the waterbodies crossed by ACP and SHP are provided in appendix K.

West Virginia Surface Water Classifications

West Virginia Code of State Regulations (WVCSR) §47-2-4 (2014) outlines an antidegradation policy that establishes three classes for waters of the State. The classes are assigned to waters in an effort to maintain quality or existing uses. The three tiers of protection are defined as follows:

- Tier 1 Protection: existing water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. Existing uses are those uses actually attained in a water on or after November 28, 1975, whether or not they are included as designated uses within the State code, water quality standards.

- Tier 2 Protection: existing high quality waters of the State must be maintained at their existing high quality. High quality waters are defined in the State code as those waters whose quality is equal or better than the minimum levels necessary to achieve the national water quality goal uses.

- Tier 3 Protection: outstanding national resource waters that have been placed on the highest tier of the State classification to provide greater protection. These include waters that are in federally designated Wilderness Areas and waters with naturally reproducing trout in State parks, national parks, and national forests.

Streams cannot be categorized as Tier 1 or Tier 2 at this time, but would be assigned by the WVDEP on a case-by-case basis during permitting, and may change depending on the timing of state's 303(d) impaired water list, which is reviewed and updated every 2 years. Assigned categories may vary based on the water quality parameters. For example, a stream could be designated as a Tier 1 for one parameter and a Tier 2 for a different parameter. Tier 2 is the default tier; however, if a stream/parameter becomes impaired, it will become a Tier 1 stream with respect to that particular parameter.

ACP and SHP pipeline facilities do not cross Tier 3 streams in West Virginia; however, a proposed access road crosses the upper reaches of Slaty Fork, a Tier 3 stream. Use of this existing access road would not likely impact the stream. We acknowledge that various tributaries that flow into Tier 3 streams would be crossed by the projects, some of which may contain trout and cross public lands. By implementing the construction and mitigation measures discussed in section 4.3.2.6, impact on these streams and stream biota would be effectively minimized.

WVCSR §47-2-6 (2014) further outlines general Water Use Categories and Water Quality Standards for waters of the State. Under the regulation, waters of the State are designated for Propagation and Maintenance of Fish and Other Aquatic Life (Category B) and Water Contact Recreation (Category C) unless otherwise designated. Other use designations assigned under the regulation include: Public Water (Category A), Warm Water Fishery (Category B1), Trout Waters (Category B2), Wetlands (Category B4), Water Contact Recreation (Category C), Agricultural and Wildlife Uses (Category D), Irrigation (Category D1), Livestock (Category D2), Wildlife (Category D3), Water Supply Industrial, Water Transport, Cooling and Power (Category E), Water Transport (Category E1), Cooling Water (Category E2), Power Production (Category E3), and Industrial (Category E4).

Virginia Surface Water Classifications

Title 9 of Virginia Administrative Code (VAC) Agency 25, Chapter 260, Section 30 (9 VAC 25-260-30) (2014) outlines an antidegradation policy that establishes three classes for waters of the Commonwealth of Virginia. The three classes are defined as follows:

- Tier 1: waters where existing water quality and uses need to be maintained.
- Tier 2: waters that are exceeding water quality standards.
- Tier 3: exceptional waters where no new discharges of pollution are allowed; these waters are required to be listed in the VAC.

ACP would not cross Tier 3 streams in Virginia, and similar to West Virginia, Tier 1 and Tier 2 streams would be assigned by the VDEQ on a case-by-case basis during permitting. Under 9 VAC 25-260-10 (2014), Commonwealth of Virginia waters are designated for recreational uses; propagation and growth of a balanced, indigenous population of aquatic life; wildlife; and the production of edible and marketable natural resources. Subcategories have been established for the propagation and growth of a balanced indigenous population of aquatic life in Chesapeake Bay and its tidal tributaries. Other subcategories have not been defined in the VAC.

North Carolina Surface Water Classifications

Title 15A of North Carolina Administrative Code (NCAC), Chapter 2, Subchapter 02B outlines State surface water and wetland standards (15A NCAC 02B.0101). Within this subchapter, classifications for surface waters are defined as follows:

- Class C: freshwater protected for secondary recreation, fishing, and aquatic life; this category includes all freshwater in the State to protect these uses.
- Class B: freshwater protected for primary recreation, including swimming and all Class C uses.
- Classes WS-I, WS-II, WS-III, WS-IV, and WS-V: waters that are protected as water supplies within watersheds of increasing development, ranging from natural, undeveloped, and upstream watersheds to moderate or highly developed watersheds.
- Class WL: waters that meet the definition of wetlands, except coastal wetlands.
- Classes SC, SB, SA, and SWL: waters including various categories of tidal salt-waters.

In addition to these classifications, the NCAC defines several supplemental classes for state waters. These include designations for Trout Waters (Tr), Swamp Waters (Sw), Nutrient Sensitive Waters (NSW), Outstanding Resource Waters (ORW), High Quality Waters (HQ), Future Water Supply, and Unique Wetland.

The NCAC (15A NCAC 02B.0201 Antidegradation) (1996) under subsection 2B, Rule .0201, establishes an antidegradation policy for North Carolina. This policy requires the establishment of classes protecting existing uses of state waters. It additionally states that projects affecting waters shall not be permitted unless existing uses can be protected. All surface waters in the state are assigned a minimum Class C designation.

Pennsylvania Surface Water Classifications

Provisions of water quality standards in Pennsylvania are provided under Title 25, Subpart C, Article II, Chapter 93 of the Pennsylvania Code (1971). The general provisions for protected water uses in Chapter 93.3 identify several categories of water uses to be protected, including cold water fisheries (CWF), warm water fisheries (WWF), migratory fishes, trout stocking, potable water supply (PWS), industrial water supply (IWS), livestock water supply (LWS), wildlife water supply (AWS), irrigation (IRS), boating (B), fishing (F), water contact sport (WC), esthetics (E), high quality waters (HQ), exceptional value waters (EV), and navigation.

Pennsylvania Code chapter 93.4 outlines uses for waters of the Commonwealth. Under this chapter, the following uses apply to surface waters unless otherwise specified in law or regulation: WWF, PWS, IWS, LWS, AWS, IRS, B, F, WC, and E. These uses must be protected in accordance with Chapter 96 of the Pennsylvania Code regarding water quality standards and other applicable Commonwealth or Federal laws and regulations.

Pennsylvania Code Chapter 93.4a outlines an antidegradation policy for surface waters of the Commonwealth. The policy states that existing in-stream water uses and the level of water quality necessary to protect existing uses shall be maintained and protected. The policy additionally states that the water quality of HQ and EV streams and lakes shall be maintained and protected, except as provided in § 93.4c(b)(1)(iii). HQ waters are defined as surface waters that have long-term water quality to support the propagation of fish, shellfish, and wildlife as well as recreation; that support high quality aquatic communities; and/or that meet Class A wild trout stream qualifications. Surface waters that qualify as EV must meet the requirements of HQ surface waters as well as one or more of the following:

- the water is within a national wildlife refuge, national natural landmark, Federal wild river, Federal wilderness area, national recreation area, or areas designated by the Commonwealth as game propagation and protection areas, park natural areas, forest natural areas, or wild rivers;
- the water is an outstanding national, Commonwealth, regional or local resource water;
- the water is a surface water of exceptional recreational significance;
- the water achieves a score of at least 92 percent using the methods and procedures described in subsection (a)(2)(i)(A) or (B); or
- the water is designated as a “wilderness trout stream” by the Pennsylvania Fish and Boat Commission (PAFBC).

In Pennsylvania, SHP facilities would cross one stream with the CWF and HQ designation, and two streams with trout stocking designations (see appendix K) (PADEP, 2013). None of the waterbodies within the SHP project area are classified as EV.

4.3.2.5 Sensitive Waterbodies

Waterbodies can be considered sensitive to pipeline construction for several reasons, including:

- waters that do not meet the water quality standards associated with the water's designated beneficial uses or has a presence of contaminated sediments, or have been designated for intensified water quality management and improvement (e.g., impaired waterbodies);

- waterbodies that are crossed less than 3 miles upstream of potable water intake structures (see table 4.3.2-4);

- waters that have outstanding or exceptional quality, ecological and recreational importance, or are in sensitive and protected watershed areas;

- waterbodies that contain sensitive fisheries, threatened or endangered species, or critical habitat; and/or

- rivers on or designated to be added to the Nationwide Rivers Inventory (NRI) or a state river inventory;

Appendix K identifies impaired waters, and waters that contain or have the potential to contain state/commonwealth or federal species that crossed by ACP and SHP. Waters that contain critical aquatic habitat or special status species; high-quality recreational, visual resource, or historic value (e.g., waterbodies listed in the NRI); sensitive state/commonwealth use or high quality designations (e.g., coldwater fisheries, trout streams, etc.) are described in more detail in sections 4.6 and 4.8.

Waterbodies That Do Not Meet Designated Use

As described in section 4.3.2.4, each state/commonwealth has developed a set of designated beneficial uses and water quality classifications for waters within the state/commonwealth. Section 303(d) of the CWA, requires each state/commonwealth to identify waters within their state where current pollution control technologies alone cannot meet the water quality standards set for that waterbody. Every 2 years, states are required to submit a list of these impaired waters as well as any that may soon become impaired to EPA. The impaired waters are prioritized based on the severity of the pollution and the designated beneficial use of the waterbody. States must establish the total maximum daily load(s) of the pollutant(s) in the waterbody for impaired waters on their list.

Atlantic and DETI reviewed the list of 303(d) Impaired Waters for each state/commonwealth to identify crossings of waterbodies (WVDEP, 2012, 2014d; VDEQ, 2015a; NCDEQ, 2015; PADEP, 2015b). There are ten 303(d) impaired waterbody crossings proposed by ACP in West Virginia, 18 in Virginia, and 1 in North Carolina (some waterbodies are crossed more than once) (see appendix K). Some waterbodies have multiple impairments. Causes of impairment include:

- iron
- total phosphorus
- conditions not allowable-biological
- fecal coliform

- enterococcus
- invasive aquatic plants
- dioxin
- polychlorinated biphenyls in fish
- pH
- temperature
- Escherichia coli (E. coli)
- benthic macroinvertebrate bioassessments
- mercury in fish
- dissolved oxygen

There are 10 303(d) impaired waterbody crossings by SHP in West Virginia and 12 in Pennsylvania (some waterbodies are crossed more than once) (see appendix K). Some waterbodies have multiple impairments. Causes of impairment include:

- fecal coliform
- iron
- conditions not allowable-biological
- aquatic life

Construction activities may result in a temporary increase in turbidity which may have the short-term impact of reducing dissolved oxygen levels and a minor impact on aquatic and other biological life; however, these impairments are not anticipated to be exacerbated in the long-term by the construction or operation of the projects. In addition, there may be a short term, minor increase in temperature in the immediate vicinity and downstream of the crossing due to clearing of riparian vegetation that provides shade and helps moderate water temperatures. Permanent right-of-way maintenance may lead to a minor and localized increase in stream temperature, but this increase is expected to be minimal. We do not believe any of the remaining impairments would be influenced by the construction or operation of the projects. The impaired waterbodies that would be crossed and the basis for their impairment are identified in appendix K.

Public Surface Water Intakes and Water Protection Areas

The WVDHHR, VDH-ODW, and NCDEQ-DWR were consulted to identify surface water intakes within 3 miles and water protection areas crossed by the current ACP and SHP facilities. Based on the information provided by these agencies, ten surface water intakes are within 3 miles of ACP, and eight source water protection watersheds would be crossed. Based on a review of PADEP public water supply data, there are no surface water intakes within 3 miles downstream of any waterbody crossed by SHP (PADEP, 2016a). Table 4.3.2-4 lists the surface water intake facilities within 3 miles and water protection areas crossed by the projects.

We received a comment from the VDEQ that waterbodies which would be crossed between AP-3 MPs 54 and 59 would discharge to Cohoon Lake and a City of Portsmouth public water intake. We have not verified if the intake is within 3 miles of any waterbody crossing. Measures that would be implemented to minimize impacts to waterbodies and downstream water uses are discussed in section 4.3.2.6.

TABLE 4.3.2-4

Surface Water Intake Facilities within Three Miles Downstream and Water Protection or Assessment Watersheds Crossed by the Atlantic Coast Pipeline and Supply Header Project

Pipeline Segment/Location	Surface Water Intake Facility	Waterbody Associated with Public Water Intake	Waterbody Location (Milepost)[a]	Zones of Critical Concern and Peripheral Concern Crossed (miles)	Source Water Protection or Assessment Watershed Crossed (miles)
ATLANTIC COAST PIPELINE					
AP-1 Mainline					
Upshur County, WV	Buckhannon Water Board	Buckhannon River	28.3 [b]	3.9/4.4	12.4
Randolph County, WV	West Virginia-American Water Webster Springs	Valley Fork - Tributary to Elk River	60.6 [b]	0.0/0.3	N/A
Randolph County, WV	Huttonsville Medium Security Prison	Tygart River Valley	65.2 [b]	0.0/0.5	3.1
Augusta County, VA	City of Staunton	Middle River	130.4	N/A	6.8
Nelson County, VA	NCSA – Schuyler Johnson's Branch	Rockfish River	175.6 [b] (Dutch Creek)	N/A	6.2
Greensville County, VA	City of Emporia	Meherrin River	286.3 [b]	N/A	3.0
AP-3 Lateral					
City of Suffolk, VA	City of Norfolk	Lake Prince	61.0	N/A	2.4
City of Suffolk, VA	City of Norfolk	Western Branch Reservoir	62.4	N/A	4.4
AP-5 Lateral					
Greensville County, VA	City of Emporia	Meherrin River	N/A [c]	N/A	0.2
SUPPLY HEADER PROJECT					
TL-635 Loopline					
Wetzel County, WV	Pine Grove Water	North Fork Fishing Creek	N/A	N/A	N/A

Sources: WVDHHR, 2003a-e, 2015a, 2015b; Soto, 2015; NCDEQ, 2014a; King, 2016a-b.

[a] Milepost of waterbody crossing connected to the public water intake source water. If the crossing is associated with a Zone of Critical Concern or Zone of Peripheral Concern, the milepost where the pipeline first enters the zone is provided.

[b] Pipeline crossing is not within 3.0 miles upstream of the public surface water intake.

[c] AP-5 crosses within the Assessment Watershed, but does not cross the Meherrin River.

N/A Source Water Assessment reports are not available to identify the Assessment Watershed for American Water Webster Springs facility in West Virginia; additionally, Zones of Critical Concern are identified in West Virginia and do not apply in Virginia.

In addition to maintaining data pertaining to surface water intakes, the NCDEQ-DWR has established public water source watersheds for areas that drain to public surface water intakes. Six public water source watersheds are crossed by the proposed ACP facilities (see table 4.3.2-5). Similar data are not available for West Virginia, Virginia, or Pennsylvania.

TABLE 4.3.2-5 **Water Source Watersheds Crossed by the Atlantic Coast Pipeline in North Carolina**			
Watershed Name/	Mileposts (AP-2 Mainline)	County	Water Supply Classification [a]
Fishing Creek (Enfield)	30.1 to 39.5	Halifax and Nash Counties	WS-IV, NSW
Tar River (Tar River Res.)	51.0 to 60.4	Nash County	WS-IV, NSW
Toisnot Swamp	60.4 to 63.8	Nash County	WS-III, NSW
Cape Fear River (Fayetteville)	130.6 to 134.5	Cumberland County	WS-IV
Cape Fear River (Smithfield Packing Co)	151.1 to 159.3	Cumberland County	WS-IV
Lumber River (Lumberton)	173.1 to 180.4	Robeson County	WS-IV

[a] Water Supply Classifications in North Carolina (NCDEQ, 2014a):
WS-III = Waters used as sources of water supply for drinking, culinary, or food processing purposes; generally, in low to moderately developed watersheds.
WS-IV = Waters used as sources of water supply for drinking, culinary, or food processing purposes; generally, in moderately to highly developed watersheds.
NSW – Nutrient Sensitive Waters, supplemental classification where additional nutrient management is needed due to potential for excessive growth of microscopic or macroscopic vegetation.

Waterbodies with Exceptional Quality or Importance

Federally Recognized Exceptional Waters

The federal government identifies outstanding waters under both the NRI (NPS, 2011) and National Wild and Scenic River (WSR) System. The NRI is a listing of free-flowing river segments that are identified as having at least one outstandingly remarkable natural or cultural value (ORV). Federal agencies must avoid or mitigate actions that have the potential to negatively impact any listed segments. The 1968 National Wild and Scenic Rivers Act (Public Law 90-542; 16 United States Code [U.S.C.] 1271 et seq.) identifies rivers as having exceptional natural, cultural and recreational values and seeks to preserve them for enjoyment of present and future generations (NPS, 2016a). No federally designated WSRs are crossed by the projects. ACP would cross 17 waterbodies listed on the NRI. No NRI rivers are crossed by SHP. Additional discussion of NRI is provided in section 4.8.5.4.

State-designated Exceptional Waters

State-designated exceptional waters and waters of significant ecological importance are described in section 4.3.2.4. Locations of waters with special state designations are provided in appendix K. Further information regarding state-designated waters as it relates to timing restrictions and other conditions is provided in section 4.6.

USACE Navigable Waters

Navigable waters are defined by the USACE as waters subject to the ebb and flow of the tide that are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Navigable waters are designated by the USACE and regulated under section 10 of the RHA. Furthermore, in accordance with section 14 of the RHA (33 U.S.C. §408) (section 408), the USACE has the authority to review requests that could modify federal projects (e.g., federal channels) to ensure that proposed modifications would not impair the usefulness of federal projects and are not injurious to the public interest.

As detailed in table 4.3.2-6, ACP would cross 12 section 10 waters. No section 10 waters would be crossed by SHP. Atlantic has submitted permit applications to the respective USACE districts requesting authorization to cross these features.

TABLE 4.3.2-6

Navigable Waters Crossed by the Atlantic Coast Pipeline

Project/Segment	Milepost	Waterbody Name	Crossing Method
AP-1 Mainline	8.2	West Fork River	Cofferdam
	76.6	Greenbrier River	Cofferdam
	184.7	James River	HDD
	220.8	Appomattox River	Cofferdam
AP-2 Mainline	9.9	Roanoke River	HDD
	98.5	Neuse River	Cofferdam
	154.2	Cape Fear River	HDD
AP-3 Lateral	32.6	Nottoway River	HDD
	38.6	Blackwater River	HDD
	63.6	Western Tributary to Nansemond River	HDD
	64.4	Nansemond River	HDD
	81.8	South Branch Elizabeth River	HDD

4.3.2.6 General Impacts and Mitigation

Impacts on waterbodies could result from construction activities in stream channels, on adjacent banks and riparian areas, and from the use of access roads. Clearing and grading of stream banks, blasting (if required), in-stream trenching, trench dewatering, and backfilling could each result in temporary, local modifications of aquatic habitat involving sedimentation, increased turbidity, and decreased dissolved oxygen concentrations. In almost all cases, these impacts would be limited to the period of in-stream construction, and conditions would return to normal shortly after stream restoration activities are completed. Agency-recommended TOYR would also be adhered to as listed in appendix K and discussed further in section 4.6.

Waterbodies would be crossed using the open-cut, flume, dam and pump, HDD, and cofferdam methods, which are described in detail in section 2.3.3.1. The specific construction method proposed for each waterbody crossing is listed in appendix K. Crossing methods for each waterbody were selected based on the topography, soil conditions, subsurface geology, and the width and depth of the waterbody. As discussed in sections 4.7.1.8 and 4.7.1.10, we have recommended that Atlantic complete hydrofracture potential analyses at two waterbodies (Neuse River and Nottoway River [AP-1 MP 260.7]), and if the hydrofracture potential is low, Atlantic should use the HDD crossing method.

We received several comments that the dry crossing method should be used instead of the open-cut method. As proposed, 91 waterbodies would be crossed by the open-cut method. Most of these crossings are waterbody/wetland complexes which do not have a defined bed or bank, making a dry crossing method infeasible. Other waterbodies are ephemeral and would likely be dry at the time of the crossing, or have specific constraints that limit the ability to successfully complete a dry crossing.

Erosion and Sediment Control

Sedimentation and increased turbidity can occur as a result of in-stream construction activities, trench dewatering, or stormwater runoff from construction areas and access roads. In slow moving waters, increases in suspended sediments (turbidity) may increase the biochemical oxygen demand and reduce levels of dissolved oxygen in localized areas during construction. Suspended sediments also may alter the chemical and physical characteristics (e.g., color and clarity) of the water column on a temporary basis. Atlantic and DETI would use material excavated from the pipeline trench in waterbodies to backfill the trench once the pipe is installed to avoid introduction of foreign substances into waterbodies. Potential effects on fisheries due to increased turbidity and sedimentation resulting from in-stream construction activities are addressed in section 4.6.

Vegetation clearing, grading for construction, and soil compaction by heavy equipment near stream banks could promote erosion of the banks and the transport of sediment into waterbodies by stormwater runoff. To minimize these potential impacts, Atlantic and DETI would install equipment bridges, mats, and pads to reduce the potential for turbidity and sedimentation resulting from construction equipment and vehicular traffic crossing waterbodies. Temporary bridges would be installed across waterbodies in accordance with the FERC *Procedures* to allow construction equipment and personnel to cross. The bridges may include clean rock fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatuses, or other types of spans. Construction equipment would be required to use the bridges, except that the clearing and bridge installation crews would be allowed one pass through waterbodies before bridges are installed. The temporary bridges would be removed when construction and restoration activities are complete. Additionally, Atlantic and DETI would locate ATWS at least 50 feet from stream banks (except for site-specific modifications requested by Atlantic and DETI and deemed acceptable by us, as described in section 2.3). Setback distances applicable to waterbodies within the MNF and GWNF are provided in section 4.3.2.8.

After the pipeline is installed across a waterbody using one of the methods described above, the trench would be backfilled with native material. Following initial stream bank stabilization, Atlantic and DETI would restore the banks of waterbodies to preconstruction contours to the extent practicable. In steep-slope areas, regrading may be required to reestablish stable contours capable of supporting preconstruction drainage patterns. Riparian areas would be revegetated with native species identified through consultation with various FWS and NRCS subject matter experts. Restoration of riparian areas would be designed to:

- restore stream bank integrity, including both shore crossings up to the OHWM;
- withstand periods of high flow without increasing erosion and downstream sedimentation; and
- include temporary erosion control fencing, which would remain in place until stream bank and riparian restoration is complete.

Permanent bank stabilization and erosion control devices (e.g., natural structures, rock riprap, and/or large woody debris) would be installed as necessary on steep banks in accordance with permit requirements to permanently stabilize the banks and minimize sediment deposition into waterbodies. Regulatory authorities or land managing agencies may impose restrictions or limitations on what materials may be used in streambank restoration.

Restoration of forested riparian areas would include seeding as discussed above, and may include supplemental plantings of tree seedlings and shrubs. Clearing of riparian trees in forested areas would reduce shade near streams, and may result in minor increases in local water temperature. Large woody debris, where available and appropriate habitat conditions exists, would be placed adjacent to waterbody crossings to add shade and fish habitat. Forested riparian areas would be restored and enhanced using plantings of native shrubs and trees, excluding the 10-foot corridor centered on the pipeline, which would be retained in an herbaceous state. On a site-specific basis and in consultation with land managing agencies or landowners, Atlantic and DETI would design riparian revegetation with the use of fast growing native trees and shrubs placed closest to the bank top to provide canopy recovery as quickly as possible to shade and overhang the waterbodies. Restoration of forested riparian areas on Federal and state/commonwealth lands would be determined based upon consultations with the appropriate land managing agencies. In addition to following the requirements of the FERC *Plan* and *Procedures*, Atlantic and DETI would construct their projects in accordance with state/commonwealth Construction Stormwater NPDES permits, which regulate the discharge of stormwater generated from construction activities. A condition of these permits would be to develop and implement a project-specific *SWPPP* or *Erosion and Sediment Control Plan*. The *SWPPP* must assess the project area and select appropriate erosion and sediment control BMPs, which are outlined in the following state guidance documents into Atlantic's and DETI's project-specific SWPPPs: WVDEP's *Erosion and Sediment Control Best Management Practice Manual* (WVDEP, 2006a), the VDEQ's *Virginia Erosion and Sediment Control Handbook* (VESCH) (VDEQ, 1992), Virginia Department of Forestry's (VDOF) *Forestry Best Management Practices for Water Quality Technical Manual* (VDOF, 2011). In addition, Atlantic would implement BMPs, as well as internal management standards and specifications.[9] Once installed, BMPs must be periodically inspected and repaired per each State's/Commonwealth's requirements. Inspections are normally required until the project has reached final stabilization and all temporary erosion and sediment BMPs have been removed. Where required by the FERC *Plan* and *Procedures*, permanent erosion controls, such as slope breakers, would be installed to aid long-term stabilization along with the restored vegetation.

As detailed in appendix K, Atlantic and DETI are proposing to use dry crossing methods (flume, dam and pump, cofferdam) on most of the waterbody crossings. Installing a pipeline via a dry crossing technique reduces the risk of sediment entering waterbodies, as the pipeline trench is isolated from flowing water. Atlantic and DETI would implement measures outlined in the FERC *Procedures* to minimize impacts on the waterbodies crossed, including the installation of trench plugs to prevent water from flowing along the trenchline during and after construction. These measures would minimize potential impacts on surface and below ground hydrology. Once construction is complete, the pipeline would be buried below the ground surface and, therefore, would not impact water retention or floodplain storage within riparian corridors. All waterbody crossings would be completed in accordance with the requirements identified in the federal or state/commonwealth waterbody crossing permits obtained for the projects.

Stormwater runoff has the potential to cause long-term, eposidic water quality impacts, particularly where access roads and steep slopes are proximate to waterbodies. Permanent erosion control measures, such as slope breakers, would be installed to aid long-term stabilization and reduce runoff and erosion potential, but must be maintained and monitored diligently after storm events to ensure proper sediment control.

Horizontal Directional Drilling

Use of the HDD method may avoid impacts on waterbodies and/or wetlands because it allows for the pipe to be installed underneath the ground surface without disturbance of the streambed or banks and wetland habitats. However, a temporary, localized increase in turbidity could occur in the event of an inadvertent release of drilling fluid (also termed an "inadvertent return") into the waterbody. Drilling fluid is composed of water and bentonite clay (a naturally occurring mineral). The EPA does not list bentonite as a hazardous substance, and no long-term adverse environmental impacts are expected should an inadvertent release occur. Similarly, while native soils may mix with the drilling fluid because of the drilling process, no adverse environmental impacts from these materials are expected should an inadvertent return occur.

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[9] DETI's 2016 *Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Linear Gas Transmission Pipeline*, and Dominion's SAIPR Policy and Procedure Handbook.

Atlantic has conducted and filed studies to determine the probability of an inadvertent release of drilling mud (e.g., hydrofracture) for 20 potential HDDs, 15 of which cross under waterbodies. The risk of hydrofracture was determined to be moderate, moderate-high, or high for four of the waterbodies (see table 4.3.2-7). As discussed in sections 4.7.1.8 and 4.7.1.10, we have recommended that Atlantic complete hydrofracture potential analyses at two additional waterbodies (Neuse River and Nottoway River [AP-1 MP 260.7]), and if hydrofracture potential is low, utilize the HDD crossing method.

TABLE 4.3.2-7

Summary of Completed Hydrofracture Analysis for Horizontal Directional Drill Waterbody Crossings

Project/Segment	Milepost	Waterbody Name	Risk of Hydrofracture
AP-1	184.7	James River/Mayo Creek	Low
AP-2	9.9	Roanoke River	Low
	33.9	Fishing Creek	Low
	40.6	Swift Creek	Low
	59.4	Tar River	Low
	73.6	Contentnea Creek	Unknown/Geotechnical data not available [a]
	82.5	Little River	Low
	154.2	Cape Fear River	Low
AP-3	32.6	Nottoway River	Low
	38.6	Blackwater River	Moderate
	61.0	Lake Prince	Low
	62.4	Western Branch Reservoir	Low-Moderate
	63.6	Western Tributary to Nansemond River Tributary	High
	64.4	Nansemond River	Moderate-High
	81.8	South Branch Elizabeth River	Low

[a] Per HDD Design Report, Revision 1 filed October 17, 2016, a geotechnical report has not yet been provided for this crossing; however, the combination of the length and diameter of the HDD falls well within the current HDD industry capabilities.

Atlantic and DETI have prepared a *HDD Plan* that describes the drilling techniques and other measures that would be implemented to minimize and address potential issues associated with HDD crossings, including an inadvertent release of drilling mud. Focused monitoring would consist of visual observation along the drilled alignment, at source waters such as seeps and springs along and near the drill path, and at the location of the inadvertent return. Focused monitoring would be conducted by the contractor and/or an EI. The EI would ensure that a sufficient number of individuals are assigned to monitoring given the size of the HDD, the number of seeps or springs along or near the drill path, and the location of the inadvertent return. The time and results of focused monitoring observations would be kept in a written log at the jobsite. The log would be available for inspection by Atlantic/DETI and its designated representatives. Upon request, Atlantic/DETI would make the logs available to agencies with regulatory jurisdiction over the crossing. In the event drilling mud is released into a waterbody, Atlantic or DETI would perform the following actions:

- The drill contractor would cease drilling and immediately notify an EI (lead EI, if possible), an Atlantic/DETI representative, and Dominion Environmental Services.
- An Atlantic/DETI representative would immediately notify the agencies with regulatory jurisdiction over the crossing.

- The drill contractor would discontinue pumping and would rotate and slowly swab the drill string, if appropriate. Swabbing involves withdrawing the drill string to mechanically clean the drilled hole, which reduces the chances of the drill string getting stuck in the hole.

- If public health, safety, and/or the environment are threatened by an inadvertent return, drilling operations would be shut down and the drill string removed from the hole until the threat is eliminated.

- If an inadvertent return occurs in a waterbody it would be more difficult to contain because the fluid would be dispersed into the water and carried downstream. In those areas that can be contained (e.g., in shallow, standing or slow moving water), the underwater return would be collected using pumps. Drilling would resume as long as the return is being adequately contained and collected.

- If the return cannot be contained using the methods described above, an attempt may be made to plug the flow path by adding thickening agents to the drilling fluid, such as additional bentonite, cottonseed hulls, or other non-hazardous materials. As noted above, Atlantic/DETI would consult with and obtain permission from the appropriate state/commonwealth regulatory agencies regarding the use of additives and confirm that the additives would not violate water quality standards if inadvertently released into the waterbody.

- If the amount of a drilling fluid return, either on land or within a waterbody or wetland, exceeds that which can be practically contained and collected, drilling operations would be suspended, and the drill contractor would notify Atlantic/DETI that drilling cannot continue. Atlantic/DETI, in consultation with the appropriate regulatory agencies, would issue a notice to proceed, notice to relocate, or notice to shut down until further notice.

- If impacts on fish or wildlife are observed due to exposure to drilling fluids, drilling operations would be suspended and the drill contractor would notify Atlantic/DETI immediately. Atlantic/DETI, in consultation with the appropriate regulatory agencies, would issue a notice to proceed, notice to relocate, or notice to shut down until further notice.

- If an inadvertent return occurs within a source water, such as a seep or spring, Atlantic/DETI would test the water for water quality and provide an alternate supply of water to affected landowners until the inadvertent return is remediated.

- If necessary, an Emergency Response Contractor would be deployed for assistance containing and remediating large returns. Emergency Response Contractors would be identified in the individual plans prepared for each crossing.

By implementing these measures, we conclude impacts from inadvertent returns on waterbodies would be appropriately monitored and mitigated.

Public Drinking Water Sources

Several comments received during the scoping period raised concerns with the potential for the project to impact public water supplies and surface water intakes (see table 4.3.2-4, above). As detailed in the table, 10 surface water intakes are within 3 miles downstream of waterbody crossings. The Prince Lake and Western Branch Reservoir would be crossed via the HDD method, while the Middle River would be crossed via the cofferdam method. The remaining waterbody crossings would be conducted using a dry crossing method, which reduces sedimentation and turbidity impacts, as the pipeline trench is isolated from flowing water.

A temporary increase in turbidity may be experienced at the Middle River during the installation of the temporary diversion structures needed for the cofferdam method. While the HDD method avoids in-stream disturbance, an inadvertent release could result in drilling mud entering the waterbody. Based on a geotechnical analysis, the risk of hydrofracture at the Prince Lake crossing is low, and the risk at the Western Branch Reservoir is expected to be low-moderate. Construction activities across waterbodies would be short-term and temporary in nature, with the primary risk to surface waters being an increase in sediment and turbidity.

During operations, the pipelines would transport natural gas, which primarily is methane. Methane is buoyant at atmospheric temperatures and pressure, and disperses rapidly in air. The pipelines would not carry liquids. Therefore, in the unlikely event of a leak, most of the methane would escape to the ground surface and dissipate into the atmosphere. As such, impacts on drinking water sources from pipeline operation are not anticipated. Future maintenance activities on the pipeline would be conducted in accordance with the FERC *Plan* and *Procedures* and applicable state/commonwealth/local permits regarding stormwater and erosion and sediment control. Moreover, Atlantic and DETI would implement an Integrity Management Program, as discussed in section 4.12, to prevent leaks on the system.

Floodplains

Atlantic and DETI have committed to obtaining floodplain permits, where applicable, for the projects (typically through county-level agencies). These permits would verify that placement of structures within a floodplain would not pose a risk of damage to the structures, and would not result in a stage increase in flood elevations of surrounding properties. While M&R stations and valves do involve some above-ground infrastructure and piping, the facilities would be built on graveled lots that allow for some infiltration of rainwater. Based on Atlantic's and DETI's construction and restoration measures, and the minor project-related modifications within floodplains, we conclude that constructing and operating ACP and SHP would not result in a significant impact on floodplains or result in a measurable increase on future flood events. Section 4.1.4.3 provides additional discussion regarding floodplains and flooding.

Contaminated Waters or Waterbody Sediments

No known contaminated waters or waterbody sediments have been identified along ACP and SHP. The locations of Superfund sites, brownfield locations, landfills (active and closed), waste stations, and LUSTs within 1,000 feet of ACP are identified in table 4.3.1-3. There are 19 LUST sites within 1,000 feet of ACP facilities near the AP-1 mainline and 21 sites near the AP-3 lateral in Virginia, and 9 sites near the AP-2 mainline in North Carolina. No other known contaminated sites would be crossed by ACP. No such sites were identified within 1,000 feet of SHP.

Section 4.8.7 of this document further addresses potential impacts to and from these sites with potential contamination, as well as mitigation protocols to minimize impacts. Particular attention is given to characterization and regulatory constraints of the Borden Smith Douglass brownfield site and mitigation protocols that Atlantic would implement during construction near this site. If contaminants are encountered during construction of ACP and SHP, Atlantic and DETI would implement the measures identified in their *Contaminated Media Plan* (see table 2.3.1-1).

Sensitive Waters

Applicable timing restrictions, permit requirements and conditions, and BMPs would be utilized to minimize impacts on sensitive waters. All USACE section 10 crossings would be completed via HDD or the cofferdam method. Atlantic has submitted applications to the respective USACE districts to permit the crossing of navigable waters, and would comply with all federal and state permit requirements.

As detailed above, ACP and SHP would cross several waterbodies that are listed as impaired with respect to their state-designated use. Most of the impairments are related to parameters that are not typically influenced by construction activities or pipeline operation (e.g., fecal coliform, dissolved metals, pH, *E. coli*). Construction activities would be temporary and short-term in nature and are not anticipated to further any of the listed impairments. Upon completion of construction activities, all upland areas would be stabilized and revegetated per the FERC *Plan* and *Procedures* and state permit conditions. Two waterbodies are listed as impaired with respect to temperature (Back Creek at AP-1 MP 87.2 and Jackson River at AP-1 MP 91.5). Once in operation, a slight localized increase in temperature may occur due to removed riparian vegetation; however, we find this to be negligible when accounting for the entire reach of the stream.

As discussed in sections 4.6 and 4.7 and identified in appendix K, many of the waterbodies to be crossed have TOYR to protect sensitive species and fisheries. Atlantic and DETI would not conduct in-water activities within these timing windows without explicit approval from the appropriate state agencies. All waterbody crossings would be constructed in accordance with applicable federal and state permits.

Blasting

As discussed in section 4.1.2.2, blasting may be required to install portions of the pipeline. Individual stream crossing locations where blasting may be necessary would be identified during construction based on site-specific conditions. Waterbodies where blasting may be required in-stream and/or or within 1,000 feet of the waterbody are identified in appendix K.

Blasting in streams would only be used when traditional means of trenching (e.g., ripper shanks, excavators, rock hammers) have failed or are deemed impractical due to constraints imposed by stream crossing time limits. If required, blasting would primarily occur at dry crossings, after the work area has been isolated from stream flow. If blasting is necessary in a flowing waterbody, the use of controlled blasting techniques, where small, localized detonations are utilized, would avoid or minimize the impacts of blasting and limit rock fracture to the immediate vicinity of these activities. Immediately following blasting, Atlantic and DETI would remove shot rock that impedes stream flow. Blasting techniques would follow federal, state/commonwealth, and local regulations governing the use of explosives and in accordance with the *Blasting Plan* (see table 2.3.1-1) and the FERC *Plan* and *Procedures*. As stipulated in the *Blasting Plan*, Atlantic and DETI would require their contractor to develop and submit a site-specific *Blasting Specification Plan* to Atlantic or DETI for approval.

Preparation of the rock for blasting (e.g., drilling shot holes) is expected to cause enough disturbance in waterbodies to displace most aquatic organisms from the immediate vicinity of the blast. To further reduce the potential for impacts on aquatic organisms in flowing waterbodies, Atlantic and DETI would use techniques such as scare charges or banging on a submerged piece of pipe before the blast to disperse mobile aquatic organisms from the blast area before the blast is conducted. These steps would avoid or minimize the impact of blasting, if necessary, on aquatic organisms; nonetheless, organisms that are not displaced by pre-blast measures could be affected.

Spill Control and Contamination

The *SPCC Plan* for ACP and SHP (see table 2.3.1-1) describes measures that personnel and contractors would implement to prevent and, if necessary, control inadvertent spill of fuels, lubricants, solvents, and other hazardous materials that could affect water quality. As required in the FERC *Procedures* and the *SPCC Plan*, hazardous materials, chemicals, lubricating oils, and fuels used during construction would be stored in upland areas at least 100 feet from wetlands and waterbodies. Refueling of construction equipment would be conducted at least 100 feet from wetlands and waterbodies, whenever possible. However, there may be certain instances where equipment refueling and lubricating may be necessary in or near waterbodies. For example, stationary equipment, such as water pumps for withdrawing hydrostatic test water, may need to be operated continuously on the banks of waterbodies and may require refueling in place. The *SPCC Plan* addresses the handling of fuel and other materials associated with the projects. As required by the FERC *Procedures*, the *SPCC Plan* would be available during construction on each construction spread.

As noted above, it is possible that previously undocumented sites with contaminated soils or groundwater could be discovered during construction of ACP and SHP. Atlantic and DETI have prepared and would implement a *Contaminated Media Plan* (see table 2.3.1-1) to address these circumstances. The *Contaminated Media Plan* describes measures to be implemented if signs of contaminated soil and/or groundwater are encountered during construction. Signs of potential contamination could include discoloration of soil, chemical-like odors, or sheens on soils or water. Containment measures would be implemented to isolate and contain the suspected soil or groundwater contamination and collect and test samples of the soil or groundwater to identify the contaminants. Once the contaminants are identified, a response plan would be developed for crossing or avoiding the site.

Trench Dewatering

During construction, the open trench may accumulate water, either from a high water table and seepage of groundwater into the trench or from precipitation. In accordance with the FERC *Plan* and *Procedures*, and when necessary, trench water would be removed and discharged into an energy dissipation/ sediment filtration device, such as a geotextile filter bag and/or straw bale structure, to minimize the potential for erosion and sedimentation. Trench dewatering may also be regulated by state/commonwealth NPDES permits and local permitting authorities.

Concrete Coating

Concrete coating is used to create negative buoyancy along the pipeline when required for waterbody or wetland crossings. The application of concrete coating would generally take place in contractor yards identified for ACP and SHP. In areas where concrete coating of pipe is required within the construction right-of-way, the coating activities would comply with the *SPCC Plan* (see table 2.3.1-1). Concrete coating activities would take place a minimum of 100 feet from wetlands, waterbodies, and springs, and 300 feet from karst features. Concrete-coated pipe would be installed after the concrete is dried and would not be dispersed when submerged in water.

BRP/ANST HDD

Separate intermittent waterbodies would be impacted by excavation and grading activities at the entry and exit workspaces of the BRP/ANST HDD. Because constructions activities at these locations could exceed one year, site-specific plans should be generated to minimize impacts on these waterbodies. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of the OEP, site-specific plans to minimize and mitigate impacts on the waterbodies that would be impacted at the BRP/ANST HDD entry and exit workspaces. Final plans should be developed in consultation the USACE and/or appropriate state agency(s).**

4.3.2.7 Water Use

Constructing ACP and SHP would require the use of water for hydrostatic testing, dust control, and the HDD construction method. The DOT requires hydrostatic testing to be completed on pipeline segments before they are placed in service under 49 CFR 192. Hydrostatic testing involves the use of water that is pressurized within pipeline segments to determine that the installed pipeline is free from leakage and possesses the strength to safely operate at the proposed MAOP. Water withdrawal would also be required for dust control and for mixing the bentonite slurry used as drilling mud for the HDDs. Each state administers a program to regulate the withdrawal and discharge of water used for hydrostatic testing under the federal NPDES permit program.

Hydrostatic Testing and Dust Control Procedures

Atlantic and DETI would require a total of approximately 86.6 million gallons of water for hydrostatic testing; 82.9 million gallons for ACP, and 3.7 million gallons for SHP. Of this volume, 46.9 and 39.7 million gallons would be required from municipal sources and surface water sources, respectively. Water for hydrostatic testing would be withdrawn and discharged in accordance with the FERC *Procedures*, state/commonwealth regulations, and required permits. Withdrawal of hydrostatic test water has the potential to temporarily affect the recreational and biological use of surface water sources if the diversion constitutes a large percentage of the source water flow. Impacts may include a temporary increase in water temperature, a reduction of dissolved oxygen levels, and entrainment of aquatic species.

During water withdrawal, surface water intakes would be set in areas of flowing water to avoid taking up sediment. The rate of withdrawal would be controlled to assure a continued flow within the surface water source, avoid impacts on aquatic resources, and maintain stream uses. Typically, water would be withdrawn at a rate of 1,500 to 3,000 gallons per minute at each withdrawal location, unless otherwise specified in applicable permits. To minimize impacts, water would be drawn out with a low-pressure pump. Screening on the intakes would be sized according to withdrawal permit requirements. Secondary containment would be used on all pumps.

Surface waterbody withdrawals would be conducted by using pumps placed adjacent to the waterbody with hoses placed into the waterbody. Intakes would be screened to prevent the uptake of aquatic organisms and fish. To minimize impacts associated from water uses, low flow conditions would be avoided and the intake hose would be screened to avoid entrapment of aquatic organisms. After the testing is complete, the discharges would be directed to dewatering structures placed in well-vegetated upland areas and monitored in accordance with each state's NPDES discharge permit. No significant water quality impacts are anticipated as a result of discharge from hydrostatic testing.

To minimize impacts of the short duration of larger volume withdrawals of water from streams, Atlantic and DETI would construct temporary cylindrical water impoundment structures adjacent to several of the water withdrawal points. Atlantic would construct 18 water impoundment structures, each with a 300-foot diameter and a storage capacity of approximately 2.5 million gallons. DETI would construct three water impoundment structures with the capacity to store 0.7 to 2.2 million gallons. The water impoundment structures would be placed in upland areas close to the source where the water is withdrawn. As stated in the *COM Plan*, no withdrawals or discharges would occur on MNF or GWNF lands. Table 4.3.2-8 provides a summary of the locations of the water impoundments.

TABLE 4.3.2-8

Water Impoundment Structures for the Atlantic Coast Pipeline and Supply Header Project

State or Commonwealth/ Construction Spread	Approximate Milepost	Location of Water Source	Quantity of water to be Stored (millions of gallons)
ATLANTIC COAST PIPELINE			
AP-1			
West Virginia			
Spread 1	8.2	Municipal Source	2.52
Spread 2	31.9	Buckhannon River	2.52
Spread 2A/3	66.2	Push from #3	2.52
Spread 3	69.2	Municipal Source	2.52
Spread 3	76.4	Municipal Source	2.52
Virginia			
Spread 3A	87.2	Back Creek	2.52
Spread 3A/4	91.3	Jackson River	2.52
Spread 5	129.1	Jennings Branch	2.52
Spread 5	163.7	South Fork Rockfish River	2.52
Spread 6	184.6	James River	2.52
Spread 6	220.7	Appomattox River	2.52
Spread 7	260.4	Municipal Source	2.52
AP-2			
North Carolina			
Spread 8	9.9	Municipal Source	2.52
Spread 8	59.4	Municipal Source	2.52
Spread 9	98.5	Municipal Source	2.52
Spread 10	154.7	Municipal Source	2.52
AP-3			
Virginia			
Spread 11	38.3	Blackwater River	2.52
SUPPLY HEADER PIPELINE			
West Virginia			
TL-635 Spread 13	29.5	South Fork Fishing Creek	0.9
TL-635 Spread 13	18.5	McElroy Creek	2.1
TL-636 Spread 14	2.7	Municipal Water Source	0.7

We received a comment that the proposed water impoundment structure near Jennings Branch would be sited on unlevel terrain and would not be appropriate for use. Our review of elevation and topographic information confirms that the proposed workspace may not be suitable; however, Atlantic has not addressed these construction constraints. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a site-specific plan for the water impoundment structure at Jennings Branch (AP-1 MP 129.1), or identify an alternative location for the structure.**

Use of the water impoundment structures would allow for a longer water withdrawal duration and at lower rates to minimize impacts on stream flows and biota present within the streams. Compliance with state/commonwealth regulations for water withdrawals would also minimize impacts on the aquatic resources. As discussed in sections 4.7.1 and 4.7.4, Atlantic and DETI will continue to coordinate with the FWS and the appropriate state agencies regarding water withdrawal in waterbodies with known or potential ESA-listed, proposed or under review species, or state-listed species. Table 4.3.2-9 summarizes the water withdrawal and discharge locations for the proposed hydrostatic testing of ACP and SHP facilities.

TABLE 4.3.2-9

Hydrostatic Testing Water Requirements for the Atlantic Coast Pipeline and Supply Header Project

State or Commonwealth/ Spread	Approximate Water Requirement (Millions of Gallons) [a]	Locations of Water Withdrawals (Milepost)	Locations of Discharges (Milepost)
ATLANTIC COAST PIPELINE			
West Virginia			
Spread 1-1	4.5	Municipal Water Source	0.0; 7.4; 8.2; 11.0; 17.2
Spread 1-2	N/A	Jump 3.5 million gallons from Spread 1-1	17.2; 20.8; 25.7; 30.7; 31.7
Spread 2-1	3.4	Buckhannon River (MP 31.7)	31.7; 31.9; 39.8; 47.3
Spread 2-2	N/A	Jump 3.0 million gallons from Spread 2-1	47.3; 52.7; 56.2
Spread 2A	N/A	Jump 2.8 million gallons from Spread 2-2	56.2; 59.1; 62.3; 65.4
Spread 3	2.6	Municipal Water Source	66.2; 69.2
Spread 3	4.5	Municipal Water Source	69.2; 72.8; 74.5; 76.4; 76.9; 79.2
Virginia			
Spread 3A	2.8	Back Creek (MP 87.2)	79.2; 87.2; 91.4
Spread 3A and 4	2.6	Jackson River (MP 91.5)	87.2; 91.4; 95.7
Spread 4	3.6	Municipal Water Source	91.4; 95.7; 97.8; 103.8
Spread 4A	2.5	Calfpasture River (MP 111.4)	103.8; 107.9; 112.2; 123.6; 125.9
Spread 5	3.2	Jennings Branch (MP 129.2)	125.9; 129.1; 130.8; 134.1; 137.7; 139.7; 140.9; 146.9; 154.0; 156.3
Spread 5	1.6	Municipal Water Source (MP 134.2)	156.3; 158.7
Spread 5	3.6	South Fork Rockfish River (MP 163.7)	158.7; 162.0; 163.8; 164.1; 169.5; 172.6; 178.9; 183.3
Spread 6	8.5	James River (MP 184.7)	183.3; 184.4; 184.8; 184.8; 199.8; 202.5; 214.3
Spread 6	6.5	Appomattox River (MP 220.8)	214.3; 228.7; 239.6
Spread 7 and 12	8.25	Municipal Water Source	239.6; 245.8; 247.5; 260.5; 272.3; 279.8; 282.4; 284.4; 291.6; 300.1
Spread 11	3.5	Blackwater River (MP 38.6)	0.0; 15.9; 17.1; 32.1; 32.5; 37.9; 38.3; 38.8; 39.0; 56.2; 57.3; 59.3; 66.3; 71.2; 71.9; 76.6
Spread 11	0.055	Municipal Water Source	60.7; 60.9
Spread 11	0.1	Western Branch Reservoir (MP 62.4)	62.0; 62.3
Spread 11	0.055	Municipal Water Source	63.2; 63.5
Spread 11	0.1	Municipal Water Source	65.1; 65.9
Spread 11	1.0	Municipal Water Source	76.6; 77.2; 77.5; 78.1; 78.6; 82.1; 82.2; 82.7
North Carolina			
Spread 8	5.1	Municipal Water Source	0.0; 2.3; 3.5; 5.4; 8.3; 10.2; 10.5; 12.8; 13.7; 27.2; 40.1; 50.7; 53.2; 57.8
Spread 8	1.6	Municipal Water Source	57.8; 59.9; 61.6
Spread 9	6.6	Municipal Water Source	61.6; 63.2; 64.2; 65.7; 74.8; 78.6; 82.4; 88.3; 93.0; 98.7; 101.1; 112.0; 117.9; 125.0
Spread 10	6.6	Municipal Water Source	125.0; 126.7; 141.0; 141.7; 153.7; 153.8; 154.0; 161.7; 163.5; 163.9; 167.1; 167.4; 177.7; 183.0
ACP Subtotal	**82.9**		
SUPPLY HEADER PROJECT			
West Virginia			
Spread 13	0.9	South Fork Fishing Creek (MP 29.5)	29.5; 30.4; 33.6
Spread 13	2.1	McElroy Creek (MP 18.5)	0.0; 7.4; 10.4; 10.9; 18.5; 29.5
Pennsylvania			
Spread 14	0.7	Municipal Water Source (MP 2.7)	0.0
SHP Subtotal	**3.7**		
TOTAL	**86.6**		

No chemicals would be added to hydrostatic test waters. Discharged test water would be monitored and/or sampled per state/commonwealth NPDES discharge permits, and appropriated water would also be sampled prior to introducing it in the pipeline to determine the ambient water characteristics that would be sampled during test water discharges. Once hydrostatic testing is complete, the test water would be discharged to well-vegetated upland areas through an approved discharge structure to remove turbidity or suspended sediments (i.e., dirt left in the pipe during construction) and to prevent scour and erosion. The discharge rate would be regulated using valves and energy dissipation devices to prevent erosion. Water would be discharged at a rate commensurate with agency consultations and permit requirements, but would typically range from 1,500 to 2,500 gallons per minute. Test water may also be discharged back to the same source from which it was obtained, which would eliminate the translocation of invasive aquatic species that may be present. This practice would also prevent transporting water from impaired streams to other waterbodies. Test water would also be discharged in accordance with the FERC *Plan* and *Procedures, the COM Plan,* and applicable permits. Efforts would be made to reuse water between test segments to decrease water withdrawal volumes. In these instances, test water would be discharged to upland areas. Alternatively, test water would be hauled offsite for disposal at an approved location. Construction related water discharges in karst areas would be directed to well-vegetated upland areas with no karst features present or to approved discharge structures.

We received comments from the Virginia Cave Board that raised concerns about discharging hydrostatic test water within the Jackson River Valley, and the potential for discharge water to flow into karst features. Atlantic is currently proposing one discharge location with the Jackson River Valley. Any discharged water would be directed away from karst features with a direct connection to the phreatic zone of the karst as outlined in the *Karst Mitigation Plan* (see appendix I). Where required, Atlantic and DETI would verify coverage under each state's/commonwealth's NPDES or equivalent general permit prior to discharge of hydrostatic test water.

In addition to the water required for hydrostatic testing, Atlantic and DETI estimate that approximately 38.2 million and 3.4 million gallons of water would be required for dust control during construction of ACP and SHP, respectively. The amount of water required for dust control would vary based on site and weather conditions, but when needed, it would be obtained in relatively small volumes throughout the construction and restoration phases of the projects. Water withdrawals would be conducted in accordance with state/commonwealth regulations and permit requirements. Typically, water for dust control would be withdrawn at a rate of 1,500 to 3,000 gallons per minute. Water sources for dust control are still being evaluated by Atlantic and DETI; however, both Atlantic and DETI have stated that water used for dust control or restoration activities would not be obtained from sensitive waterbodies. Due to the overall large quantity of water needed for dust control and because appropriation sources are currently unknown, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, proposed or potential sources of water used for dust control, anticipated quantities of water to be appropriated from each source, and the measures that would be implemented to ensure water sources and any related aquatic biota are not adversely affected by the appropriation activity.**

Water for hydrostatic testing would generally be withdrawn between August and October; however, this schedule would be dependent on the timing of permit approvals and construction schedules and may be subject to adjustment. Water for fugitive dust control would generally be withdrawn between the months of May and September. We reviewed Atlantic's and DETI's proposed withdrawal and discharge measures and, with our recommendation, conclude they would avoid and minimize the potential for significant impacts on surface water resources.

Horizontal Directional Drill Mud Water Use

As discussed in section 2.3.3.2, Atlantic is proposing to use the HDD method at 20 locations, including 15 waterbodies and 5 road/trail crossings. The HDD method is not proposed for any portion of SHP. The estimated water requirements and withdrawal location for each of the proposed HDDs are summarized in table 4.3.2-10. Water withdrawals would be conducted in accordance with state/ commonwealth regulations and permit requirements.

Extra Workspaces within 50 Feet of Waterbodies

Atlantic's and DETI's construction and restoration plans, along with the FERC *Procedures,* specify that extra workspace should not be within 50 feet of waterbody boundaries except where an alternative distance has been justified and deemed acceptable by FERC. Atlantic and DETI have requested alternate extra workspace setbacks in certain locations (see our discussion in section 2.3 and table 2.3.1-2). As discussed in section 2.3, we have found Atlantic's and DETI's request for setback modifications acceptable. However, as noted in section 2.3, additional modifications appear to be proposed but have not been identified or justified by Atlantic and DETI. These modifications are not considered acceptable until appropriate justification is provided and we concur with the justification. Setback distances on NFS lands are described in section 4.3.2.8.

4.3.2.8 Water Resources on Federal Lands

As summarized in table 4.3.2-11, ACP would require 21 waterbody crossing on the MNF (2 crossed by the pipeline, 19 crossed by access roads) and 36 on the GWNF (28 crossed by pipeline, 8 crossed by access roads). Detailed waterbody information for the MNF and GWNF is provided in appendix K.[10]

On August 24, 2016, Atlantic filed a draft *COM Plan* with the FERC and FS (see appendix G). Atlantic prepared the draft *COM Plan* for the portions of the ACP facilities located on NFS lands based on consultations with the MNF and GWNF (and other entities). Temporary and permanent impacts on waterbodies on NFS lands would be similar to those described in sections 4.3.2.6 and 4.3.2.7. Atlantic is in active consultation with the MNF and GWNF to update and finalize the *COM Plan*, which may contain unique requirements/restrictions for construction and restoration activities on NFS lands. At this time, the *COM Plan* is in draft form, and it is unclear if erosion control and rehabilitation measures would meet the standards of the Forest Plan. Thus, specific effects are unknown pending revisions to the *COM Plan*. Any necessary mitigation measures would be incorporated into the *COM Plan* and SUP to achieve consistency with MNF and GWNF LRMP standards.

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[10] Waterbodies in appendix K that are located on NFS land are shaded.

TABLE 4.3.2-10					
Water Requirements for Horizontal Directional Drills for the Atlantic Coast Pipeline					
Project/HDD	County or City / State or Commonwealth	Pipeline Segment / Milepost	Approximate Water Requirement for Hydrotesting (millions of gallons)	Approximate Water Requirement for Drilling Mud (millions of gallons)	Locations of Water Withdrawals
Interstate 79	Lewis County, West Virginia	AP-1 MP 14.0	0.2	1.4	Municipal Water Source
BRP/ANST	Augusta County, Virginia	AP-1 MP 158.2	0.3	4.5	Water will be Trucked In (Source Point; South. James River Road Boat Ramp)
James River	Nelson and Buckingham Counties, Virginia	AP-1 MP 184.7	0.2	1.5	James River
Roanoke River	Northampton and Halifax Counties, North Carolina	AP-2 MP 9.9	0.08	0.5	Roanoke River
Fishing Creek	Halifax and Nash Counties, North Carolina	AP-2 MP 33.9	0.09	1.5	Municipal Water Source
Swift Creek	Nash County, North Carolina	AP-2 MP 40.6	0.08	1.3	Municipal Water Source Trucked In
Tar River	Nash County, North Carolina	AP-2 MP 59.4	0.08	1.2	Tar River
Contentnea Creek	Wilson County, North Carolina	AP-2 MP 73.6	0.07	1.1	Contentnea Creek
Little River	Johnston County, North Carolina	AP-2 MP 82.5	0.07	0.6	Municipal Water Source Trucked In
Cape Fear River	Cumberland County, North Carolina	AP-2 MP 154.2	0.08	0.6	Municipal Water Source
Nottoway River	Southampton, Virginia	AP-3 MP 32.6	0.03	0.3	Municipal Water Source
Blackwater River	Southampton County and City of Suffolk, Virginia	AP-3 MP 38.6	0.03	0.4	Blackwater River
Prince Lake	City of Suffolk, Virginia	AP-3 MP 61.0	0.03	0.3	Prince Lake
Western Branch Reservoir	City of Suffolk, Virginia	AP-3 MP 62.4	0.02	0.3	Western Branch Reservoir
Western Branch Nansemond River	City of Suffolk, Virginia	AP-3 MP 63.6	0.05	0.6	Municipal Water Source
Nansemond River	City of Suffolk, Virginia	AP-3 MP 64.4	0.06	0.7	Municipal Water Source
Route 58	City of Suffolk, Virginia	AP-3 MP 71.5	0.04	0.4	Municipal Water Source
I-64 Crossing	City of Chesapeake, Virginia	AP-3 MP 77.8	0.03	0.3	Unnamed Pond at 36° 45’ 52” 76° 20’ 29”
US Route 17	City of Chesapeake, Virginia	AP-3 MP 78.6	0.05	0.5	Unnamed Pond at 36° 45’ 54” 76° 20’ 17”
South Branch Elizabeth River	City of Chesapeake, Virginia	AP-3 MP 81.8	0.03	0.3	Municipal Water Source
		TOTAL	**1.6**	**18.3**	

TABLE 4.3.2-11					
Waterbodies Crossed by the Atlantic Coast Pipeline on Federal Lands					
	Waterbody Type				
Federal Land Unit	Perennial	Intermittent	Ephemeral	Canal/ Ditch	Open Water Ponds
MNF	4	13	4	0	0
GWNF	13	15	6	0	2
BRP	0	0	0	0	0

All waterbodies within the MNF and GWNF would be crossed using dry open-cut methods (e.g., dam and pump, flume). Specialized pipeline construction procedures, waterbody crossing methods, and erosion and sediment control details are discussed in the draft *COM Plan*. However, we acknowledge that the FS may have additional waterbody crossing measures that would be incorporated into the final *COM Plan*.

As discussed in section 4.3.2.6, all land-disturbing activities would conform, at a minimum, to the FERC *Plan* and *Procedures*. Atlantic would also prepare and comply with *SWPPPs* that meet each state's requirements, as well as Atlantic's and DETI's internal management standards and specifications. Detailed erosion and sediment control measures, which incorporate conditions from the guidance documents referenced above, are provided in the draft *COM Plan*.

As stated in the FS' comments on the draft EIS, and to meet the requirements of the Forest Plans for the GWNF (FS, 2014), ATWS must be set back a minimum of 100 feet from perennial waterbody crossings on NFS lands, and potentially a greater distance depending on slope. Intermittent streams would require a minimum setback distance of 50 feet (or greater depending on slope), and channeled ephemeral streams would require a minimum of 25 feet. To meet the requirement of the Forest Plan for the MNF (FS, 2011), ATWS would be required to be set back a minimum of 100 feet for perennial and intermittent streams with a drainage area of at least 50 acres, a minimum of 50 feet for intermittent streams on NFS lands with a drainage area of less than 50 acres, and a minimum of 25 feet for ephemeral streams.

Temporary sediment barriers would be installed around disturbed areas as outlined in the FERC *Procedures*. Upon completion of construction, Atlantic would install permanent erosion control measures at stream crossing locations to provide long-term protection of water quality according to the FERC *Procedures* and permit requirements. To help prevent the spread of noxious and invasive weeds, Atlantic would use equipment that has been cleaned prior to working on ACP, as required by applicable permits and the FERC *Plan* and *Procedures*.

Within riparian corridors on NFS lands, in-stream and terrestrial woody debris removed as part of the stream crossing would be replaced during restoration of the pipeline right-of-way as practicable. Additional details regarding restoration of upland vegetation on NFS lands are provided in section 4.4.7.

The FS has stated that between October 1 through June 1 potential sediment-producing ground disturbing activities within the MNF that are within 100 feet of a perennial trout streams require the use of additional erosion control measures and seeding or mulching, applied concurrently with the activity. Atlantic would implement these measures as required by the FS. Additional details regarding aquatic resources on NFS lands are included in section 4.6.5. Additional TOYR may be implemented within the GWNF.

No water would be appropriated from sources within the MNF or GWNF, and no hydrostatic test water discharges would occur on NFS lands. In addition, no water impoundment structures would be utilized within the MNF or GWNF. Further, concrete coating would only be required on NFS lands if necessitated by site-specific conditions.

The proposed route crosses three 6th level Hydrologic Unit Code (HUC) watersheds that are included in the Federally Listed Fish and Mussel Conservation Plan developed by the GWNF and FWS in 2004. The proposed route also crosses four Priority watersheds as identified in the GWNF Forest Plan. The 6th level priority watersheds affected include: Cabin Creek-Mill Creek, Inch Branch-Back Creek, Canada Run-South River, and Scotchtown Draft-Cowpasture River. The effects of the proposed pipeline on these watersheds is generally analyzed in sections 4.3.2.6 and 4.3.2.7. In addition, the proposed route between AP-1 MPs 154.0 to 155.2 crosses GWNF lands that are adjacent to one impaired waterbody, as determine by the 2014 VDEQ 303(d) list. Back Creek from its confluence with the North and South Forks of Back Creek downstream to its confluence with South River (VAV-B31R_BCK01A00) is not supporting the aquatic life and recreation criterion for Benthic-Macroinvertebrate Bioassessments and *E. coli*. Listed impairment sources include wildlife other than waterfowl, non-point source, agriculture, and unknown sources. The benthic macroinvertebrate impairment can be caused by numerous factors, but are often associated with sedimentation and/or low flow conditions, which has the potential to be exacerbated by the proposed pipeline construction and maintenance. Episodic erosion and sedimentation from surface runoff has the potential to negatively impact benthic macroinvertebrates. *E. coli* is directly tied to livestock or septic sources; therefore, the project would not contribute to this impairment. Limited water quality data were presented for streams in this vicinity due to the intermittent flow regimes; however, some macroinvertebrate information is discussed in section 4.6.5. All other waterbodies on the GWNF meet water quality standards or have not been assessed by the VDEQ.

Some extreme and unpredictable impacts from seasonal precipitation events could cause slope instability, flash flooding, and debris flow hazards along the right-of-way or access roads. These events could have significant short term and long-term impacts on water resources. Mass sediment/debris loading to streams may result in substantial water quality impairments related to water chemistry and stream channel geomorphology. Impacts could drastically alter water temperature, turbidity, dissolved oxygen, and other water quality criteria, as well as benthic-macroinvertebrate bioassessments. These extreme events have the potential to cause temporary or long-term impairments of VDEQ state standards based on various numerical or narrative criterion.

Sedimentation Analysis for NFS Lands

Sedimentation analyses were presented in the draft BE for ACP, dated March 2017,[11] specifically, in appendix H, "Soil Erosion and Sedimentation Modeling Report," and in appendix I, "Downstream Sedimentation Analysis." Appendix H of the draft BE presents the results of modeling using the RUSLE2. Table 4.6.5-1 of appendix H presents the model results by subwatershed, which indicate an annual soil loss ranging from 2.19 to 8.00 tons/acre during the first year of construction, equating to 200 percent to 800 percent above baseline erosion for that subwatershed. Thus, the model predicted significant increases in erosion during construction, with rates typically approximating preconstruction levels within 5 years following restoration.

The use of water bars (i.e., slope breakers) was assumed on long slopes to break runoff patterns in discrete, shortened flow paths for RUSLE2 applicability (no concentrated flow paths). An accelerated construction schedule is proposed to shorten the construction duration for steep (greater than 30 percent) slope areas from a typical 3-month to 2 weeks. A comparison of erosion rates was also presented, comparing results from a watershed-based analysis using RUSLE to the construction-site-based analysis using RUSLE2.

[11] The BE for the ACP can be found under FERC Accession No. 20170310-5157 at the following website location: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170310-5157.

Water bar installation is a recognized method to prevent concentrated flow on the right-of-way. Once pipe installation is complete, the trench is backfilled, and the right-of-way is graded to approximate preconstruction contours. However, water bars create concentrated flows where they discharge adjoining off right-of-way areas. The FS has stated that Atlantic has not assessed how or whether the adjoining areas can receive concentrated flows, or whether measures would be implemented to allow these areas to safely receive and convey the concentrated flows. In addition, the slopes to be encountered in the MNF and GWNF would require several water bars to be "stacked" along their length, creating multiple points of discharge. The FS has stated the potential impacts of multiple points of concentrated discharges onto the adjoining areas has not been assessed.

An accelerated construction schedule is a recognized and extremely effective means of reducing the probability of a storm event occurring during construction or restoration. Atlantic's analyses performed provide a comparison of a typical construction schedule (3 months) versus the accelerated construction schedule (2 weeks), with both construction periods assumed to begin in April. Because the summer months have the greatest potential for significant, intense storm events that could yield high erosion rates, the comparison has a bias, in that the results present a beneficial scenario for the proposed accelerated construction schedule. Since pipeline construction on steep slopes would occur throughout the year, the benefits of the accelerated construction schedule, while still significant and meaningful, would be reduced from the values presented. The presented comparison of the project with proposed erosion and sedimentation controls versus no erosion and sedimentation controls is meaningful only in demonstrating the benefits of implementing erosion and sedimentation controls.

The impacts of ACP, however, should be evaluated based on a comparison of the proposed project to preconstruction conditions. The predicted erosion rates (and subsequent sedimentation) from ACP, given the proposed erosion and sedimentation controls to be determined in the *COM Plan*, would then be used to identify and evaluate potential impacts. Appendix I of the "Soil Erosion and Sedimentation Modeling Report" discusses impacts from sedimentation. The appendix I discussion is general, presenting statements with no supporting documentation. No correlation or reference exists between Atlantic's appendix I information and the analyses performed and described in appendix H, and thus water resource impacts from sedimentation are largely uncertain. Lastly, the *COM Plan* is in draft form, and it is unclear if erosion control and rehabilitation measures would meet Forest Plan Standards. Thus, the FS believes sedimentation effects on water resources are unknown pending incorporation of necessary mitigation measures as revisions to the *COM Plan*.

4.3.2.9 Conclusion

Surface waters would experience short-term impacts during construction activities as a result of potential blasting, trenching, installation of the pipeline, water withdrawals for HDD construction, hydrostatic testing, and dust control. Water quality parameters such as turbidity and water temperature would likely increase at site-specific stream crossings in the short term. Long-term impacts on surface waters resulting from increased erosion and sedimentation from the construction right-of-way and access road use, and removal of riparian vegetation are anticipated to be minor, under normal circumstances, because ACP and SHP would not permanently affect the designated water uses; the pipeline would be buried beneath the bed of all waterbodies, Atlantic and DETI would implement erosion controls as dictated by NPDES construction stormwater permits and section 404 USACE permits, water discharges would be in accordance with BMPs and all applicable permits, and the streambanks and streambed contours would be restored as close as practical to preconstruction conditions. Our recommendations regarding water withdrawals and turbidity modeling would also ensure impacts on surface water resources are minimized.

Long-term impacts related to slope instability adjacent to streams have the potential to adversely impact water quality and stream channel geometry, in addition to downstream aquatic biota. Restoration and revegetation of disturbed areas would be completed in accordance with federal and state/ commonwealth permits, and the FERC *Plan* and *Procedures*. As detailed in section 2.5.6, post-construction monitoring would also be required to assure successful re-establishment of vegetation and stability of upland soils and slopes which drain to surface waters. Once the facilities are place into service, Atlantic and DETI would perform periodic fly-overs of the route to assist in evaluating the condition of its permanent easement, including streambank stability and noting any areas where scour has occurred and/or the pipeline has been exposed. Atlantic and DETI would perform additional stabilization and maintenance in these areas, as needed.

Normal operation of the project facilities would negligibly impact surface waters, unless maintenance and repair activities are required within or adjacent to surface waters. However, ongoing impacts could occur due to increased surface runoff and erosion/sedimentation from cleared areas, disturbed steep slopes, surface compaction, access roads, and the proximity of the right-of-way and other features to streams. If sources of sedimentation result from stormwater runoff from access roads or the construction right-of-way, and are received by waterbodies, there is potential for substantial episodic impacts. These episodic impacts to water quality are unknown, since they depend on the scope and magnitude of the storm event. Before an applicant can proceed with maintenance activities, it must demonstrate compliance with environmental requirements, such as the FERC *Plan* and *Procedures* and similar federal, state, and local permitting requirements. As a result, we conclude that any surface water impacts from future maintenance activities would be mostly short-term and similar to those discussed above for the initial pipeline construction.

4.3.3 Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE, 1987). Wetlands serve a variety of functions including, but not limited to flood control, groundwater recharge, maintenance of biodiversity, wildlife habitat, recreational opportunities, and maintenance of water quality.

Wetlands potentially affected by ACP and SHP are regulated at the federal, state, and local level. At the federal level, the USACE regulates wetlands under section 404 of the CWA and section 10 of the RHA, and the EPA shares responsibility to administer and enforce the section 404 program. Section 404 regulates the discharge of dredged or fill material into waters of the United States, including wetlands. ACP would cross four USACE Districts, including Pittsburgh, Huntington, Norfolk, and Wilmington. Project facilities in Harrison, Lewis, Upshur, and Randolph Counties, West Virginia, are in the Pittsburgh District. Facilities in Pocahontas County, West Virginia, are in the Huntington District. ACP facilities in Virginia are in the Norfolk District, and facilities in North Carolina are in the Wilmington District. SHP facilities in Pennsylvania and in Harrison and Marshall Counties, West Virginia are in the Pittsburgh District, and SHP facilities in Wetzel, Tyler, and Doddridge Counties, West Virginia, are in the Huntington District. As part of their application for a USACE Nationwide Permit Number 12, Atlantic and DETI submitted wetland delineation reports to the USACE and requested a preliminary jurisdictional determination of the wetlands identified within the project work areas.

Wetland activities under section 401 of the CWA are delegated to the appropriate state agencies: the PADEP in Pennsylvania, WVDEP in West Virginia, VDEQ in Virginia, and NCDEQ in North Carolina. Consultation meetings with the Virginia Marine Resource Commission (VMRC) revealed that the VMRC would act as the local wetlands board for impacts to tidally influenced wetlands in the City of Chesapeake.

4.3.3.1 Existing Wetlands

Based on a review of publicly available NWI data, Pennsylvania, West Virginia, Virginia, and North Carolina have approximately 573,000, 80,000, 3.59 million, and 7.23 million acres of wetlands, respectively.

Atlantic and DETI conducted wetland surveys during the 2014, 2015, and 2016 field seasons to determine the extent of wetlands potentially affected by the pipeline route, access roads, ATWS, aboveground facility sites, pipe/contractor yards, and staging areas. Wetland boundaries were delineated using the methods described in the 1987 Corps of Engineers Wetlands Delineation Manual (USACE, 1987). In addition, the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) or the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Atlantic and Gulf Coastal Plain Region, were used. Atlantic and DETI utilized a 300-foot-wide survey corridor centered on the proposed pipeline centerline, a 50-foot-wide survey corridor centered over access roads, and surveyed the construction footprints at aboveground facility sites.

Wetland surveys have been conducted along approximately 92 percent of the proposed ACP route and 93 percent of the SHP route, and most proposed contractor yards, access roads, and aboveground facility sites have been surveyed. In areas where field surveys were not possible, such as denied access parcels, NWI data, USGS topographic maps, SSURGO data, and high resolution photography were used to approximate the locations and boundaries of wetlands within the project area. Atlantic and DETI would be required to complete wetland surveys and obtain necessary authorizations for all project areas prior to construction.

4.3.3.2 Wetland Types

Wetlands impacted by the projects are classified as palustrine (freshwater wetlands) or estuarine (tidal wetlands) and are defined by their dominant vegetation layer (emergent, scrub-shrub, or forested) or their substrate material (unconsolidated, percent and type of vegetation cover) (Cowardin et al., 1979). In natural systems, these wetland types are often interspersed, creating a mosaic landscape. Wetlands classified as riverine or lacustrine are classified as waterbodies and discussed in section 4.3.2. The five basic wetland types that were delineated in the project area are described below.

Palustrine Emergent Wetlands

Palustrine emergent wetlands (PEM or emergent wetlands) are dominated by erect, rooted, herbaceous, perennial hydrophytic vegetation suited to growing in wet conditions (Cowardin et al., 1979). Vegetation may also include mosses and lichens. Emergent wetlands were delineated in both ACP and SHP project areas in all four states. Emergent wetlands in the project area were dominated by a variety of ferns, sedges, grasses, rushes, and other herbaceous vegetation in all states.

Palustrine Scrub-Shrub Wetlands

Palustrine scrub-shrub wetlands (PSS or scrub-shrub wetlands) are typically shrub swamps at the transition between herbaceous (emergent) and forested habitats. Scrub-shrub wetlands are dominated by woody vegetation less than 20 feet tall, including tree shrubs, young trees, and trees or shrubs that are small due to environmental conditions (Cowardin et al., 1979). Scrub-shrub wetlands were delineated in the ACP project area and in the West Virginia portion of the SHP project area. Scrub-shrub wetlands in the project area are dominated by herbaceous species similar to those found in emergent wetlands, along with a variety of bushes and vines, willows, birch, alders, and maples.

Palustrine Forested Wetlands

Palustrine forested wetlands (PFO or forested wetlands) are dominated by trees and shrubs at least 20 feet tall with a tolerance to a seasonally high water table (Cowardin et al., 1979). Forested wetlands typically have a mature tree canopy with a diverse range of understory and herbaceous community structure and species. Forested wetlands were delineated in both ACP and SHP project areas in all states. Forested wetlands in the project area are dominated by herbaceous and shrub species similar to those found in emergent and scrub-shrub wetlands, along with a variety of ash, maple, oak, birch, and tupelos, among others.

Estuarine Intertidal Emergent Wetlands and Intertidal Unconsolidated Shore Wetlands

Estuarine intertidal emergent wetlands (E2E) are vegetated and non-vegetated brackish and saltwater wetlands characterized by plants that grow primarily on or below the surface of the water for most season, including erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Intertidal unconsolidated shore wetlands (E2U) have unconsolidated substrates, little areal cover of vegetation other than pioneering plants, and a variety of water regimes (National Aeronautics and Space Administration, 1996). E2E and E2U wetlands were only delineated in the ACP project area in Virginia.

4.3.3.3 Sensitive Wetlands

Wetlands can be categorized as sensitive or significant due to a high ecological quality and high level of functionality. Unique wetlands or wetlands of exceptional value often support unique, rare, threatened, endangered, or exceptional plant or animal species. They provide exceptional ecological function and cannot be easily replaced. Such wetlands are typically classified by state agencies and are provided special protection.

Spruce Creek Tributary Conservation Site

The proposed ACP route crosses the Spruce Creek Tributary Conservation Site between AP-1 MPs 162.1 and 162.6. The conservation site, which has been given a high biodiversity ranking as an indicator of its rarity and quality, was established by the VDCR to protect a Central Appalachian Low-Elevation Acidic Seepage Swamp. Comments were received regarding the avoidance of the Spruce Creek Tributary Conservation site and the quality, habitat, and features of wetlands in the area, and a letter was received from the VDCR recommending the avoidance of the Spruce Creek Tributary Conservation Site. Atlantic adopted a route adjustment that avoids the swamp; however, the route crosses a 77-acre protection buffer, or conservation site, around the swamp. The associated buffer that makes up the Spruce Creek Tributary Conservation Site has been deemed necessary for the seepage swamp's conservation.

Meherrin River and Fountains Creek Wetlands

The AP-3 lateral would cross the Meherrin River and Fountains Creek watersheds in southeastern Virginia. These watersheds are part of The Nature Conservancy's Albemarle Sound Whole System project area. These wetlands and riparian area contain large intact forested wetlands that support high levels of use by migratory and breeding birds and provide exceptional migratory fish spawning and nursery habitats. While this extensive watershed could not be completely avoided by ACP, Atlantic incorporated a specific route alternative to reduce the amount forested wetland that would be crossed by the AP-3 lateral.

Chesapeake Wetland Mitigation Bank

The AP-3 lateral would cross the Chesapeake Wetland Mitigation Bank near AP-3 MP 75. The Living River Restoration Trust holds the conservation easement and protects the conservation value of the property. Atlantic and the Trust are in discussions regarding the type and amount of compensatory mitigation required to offset the negative impacts of crossing the easement.

Cypress Gum Swamps

Cypress gum swamps are found in coastal marshes, swamps, pocosins, lake and pond margins, and brown and blackwater rivers of Maryland, Delaware, and Virginia, as well as coastal areas of southeastern states. These swamp systems provide an abundance of aquatic and wildlife habitat and enhance groundwater and surface water quality for receiving systems. ACP would cross 14 cypress gum swamps as outlined in table 4.3.3-1.

TABLE 4.3.3-1

Cypress gum Wetlands Associated with Large Riparian Systems Crossed by the Atlantic Coast Pipeline

Pipeline Segment/Location	Wetland Location (Milepost)	Crossing Length (feet)	Construction (acres)[a]	Operation (acres)[b]	Construction Method
AP-1 Mainline					
Greensville County, VA	295.6	609	1.0	0.4	Open-Cut
	296.9	932	1.5	0.6	Open-Cut
AP-2 Mainline					
Northampton County, NC	0.3	278	2.3	0.9	Open-Cut
Johnston County, NC	101.2	944	1.6	0.7	Open-Cut
	106.5	1,411	2.5	1.0	Open-Cut
Cumberland County, NC	131.8	1,975	3.4	1.4	Open-Cut
Robeson County, NC	160.3	1,904	4.9	1.3	Open-Cut
	176.7	2,485	5.5	1.7	Open-Cut
AP-3 Lateral					
Greensville County, VA	12.3	481	0.8	0.3	Open-Cut
Southampton County, NC	31.8	504	0.8	0.3	Open-Cut
	32.6	842	0.9	0.6	HDD
	38.1	638	1.1	0.4	Open-Cut
City of Suffolk, VA	38.6	210	0.2	0.1	HDD
	56.1	1,000	1.6	0.7	Open-Cut
	Totals	**14,213**	**28.1**	**10.4**	

[a] Construction impacts include wetlands located within temporary workspaces, access roads, yards, aboveground facilities, and the permanent pipeline right-of-way.
[b] Operational impacts include wetlands located within permanent pipeline right-of-way.

4.3.3.4 State Wetland Classification and Regulation

Pennsylvania

Pennsylvania Code Title 25, Chapter 105.17 (1991) states the important public value provided by wetlands and provides wetlands special protection by PADEP. The Code classifies wetlands into one of two categories: exceptional value wetlands, and wetlands not categorized as exceptional value wetlands. Exceptional value wetlands are defined as wetlands that exhibit one or more of the following characteristics:

- serve as habitat for species listed as threatened or endangered under the ESA;

- are hydrologically connected to or located within 0.5 mile of wetlands that serve as habitat for threatened or endangered species;

- are in or along the floodplain of the reach of a designated wild trout stream, National wild or scenic rivers in accordance with the Wild and Scenic Rivers Act of 1968, or state-designated wild or scenic rivers under the Pennsylvania Scenic Rivers Act;

- are located along an existing public or private drinking water supply; or

- are in areas designated by PADEP as natural or wild areas within state forest or park lands, designated as Federal wilderness under the Wilderness Act or the Federal Eastern Wilderness Act of 1975, or located in areas designated as National natural landmarks by the Secretary of the Interior.

Neither ACP nor SHP portions of the project would impact exceptional value wetlands in Pennsylvania.

West Virginia

West Virginia Code does not define sensitive, unique, or exceptional value wetlands. However, wetlands are protected under the West Virginia Water Pollution Control Act (WPCA), which delegates the responsibility to protect all waters of the state to the WVDEP. The WPCA, which defines wetlands as a water of the state, requires a permit for activities that may cause an alteration to the physical or biological integrity of waters of the state. ACP would be permitted under the WVDEP's Individual 401 Water Quality Certification (401 WQC). SHP would not require a 401 WQC from WVDEP.

Virginia

Virginia's first major wetland classification divides the state's wetlands into either nontidal or tidal wetlands. Nontidal wetlands are unaffected by tides and are generally characterized by their vegetation type, which can be extremely diverse. The Nontidal Wetlands Act enables the VDEQ to regulate activities in all nontidal wetlands, irrespective of federal jurisdictional status.

Tidal wetlands, also referred to as estuaries, are semi-enclosed coastal waterbodies affected by tides and by freshwater; estuaries have salinity gradients that range from freshwater to brackish to saltwater, which often changes daily or seasonally. Citizen-run local wetland boards adopt model wetland zoning ordinances and regulate tidal wetlands under the Virginia Tidal Wetlands Program. The VMRC maintains oversight authority for the wetland boards and in areas in which boards do not exist, the VMRC remains the main authority (Moulds et al., 2005). As indicated in section 4.3.3, for ACP, the VMRC would act as the local wetlands board for impacts to tidally influenced wetlands in the City of Chesapeake.

North Carolina

North Carolina classifies its wetlands into freshwater wetlands (Class WL) and tidal wetlands (Class SWL), as well as a supplemental classification of unique wetlands (UWL), or "wetlands of exceptional state or national ecological significance which require special protection to maintain existing uses" (NC Admin Code, 2000). The state regulates wetlands primarily on section 401 water quality certification, but has also adopted three additional sets of regulations for wetland protection.

The first additional regulation for wetland protection pertains to section 401 certification and isolated wetlands. The NCDEQ-DWR administers the section 401 water quality certification program, and in 2001 the state adopted similar rules pertaining to discharges into isolated wetlands to regulate wetlands not covered by the rules of the USACE or NRCS. The second additional regulation for wetland protection is the Coastal Area Management Act, which applies to the state's 20 coastal counties. The third additional regulation for wetland protection pertains to riparian area buffers, which create a 50-foot-wide riparian buffer along waterways in the Neuse and Tar-Pamlico river basins, and in the Randleman Lake river basin (Environmental Law Institute, 2008). The second regulation does not apply to ACP and SHP, as the projects would not cross any of the coastal counties of North Carolina. The project area would coincide with the Neuse and Tar-Pamlico river basins, which requires additional consultation with the NCDEQ.

4.3.3.5 General Impacts and Mitigation Measures

Impacts on wetlands as a result of the projects would include those within temporary workspaces as well as those within the permanent operational footprint. Table 4.3.3-2 summarizes the wetland types that would be crossed and impacted by ACP and SHP; section 4.3.3.6 discusses project-specific impacts on wetlands; and appendix L details impacts at each wetland crossing.

TABLE 4.3.3-2

Summary of Wetland Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project [a]

Type/State [b]	Crossing Length (feet)	Construction (acres)[c]	Operation (acres)[d]
PEM Wetlands			
West Virginia	12,018	14.8	2.9
Pennsylvania	346	0.7	0.0
Virginia	33,201	50.6	0.6
North Carolina	16,396	25.0	0.2
Total PEM Wetland Impacts	**61,961**	**91.0**	**3.7**
PSS Wetlands			
West Virginia	498	0.8	0.4
Pennsylvania	0.0	0.0	0.0
Virginia	23,774	45.6	5.4
North Carolina	29,608	51.1	7.1
Total PSS Wetland Impacts	**53,880**	**97.4**	**12.9**
PFO Wetlands			
West Virginia	1,159	1.6	0.9
Pennsylvania	199	0.4	0.1
Virginia	114,508	210.6	77.8
North Carolina	216,025	391.6	148.3
Total PFO Wetland Impacts	**331,891**	**604.1**	**226.9**
Estuarine Wetlands			
Virginia	4,694	5.1	0.4
Total Estuarine Wetland Impacts	**4,694**	**5.1**	**0.4**
PUB Wetlands			
West Virginia	96	0.1	0.1
Total PUB Wetland Impacts	**96**	**0.1**	**0.1**
Total Wetland Impacts	**452,522**	**798.2**	**243.9**

[a] Includes total impacts due to pipeline facilities, aboveground facilities, and access roads for both ACP and SHP.
[b] Wetland classification according to Cowardin et al., 1979.
[c] Construction impacts include wetlands located within temporary workspaces, access roads, yards, aboveground facilities, and the permanent pipeline right-of-way.
[d] Operational impacts include wetlands located within permanent pipeline right-of-way, access roads, and aboveground facilities.

Note: Sum of addends may not equal total due to rounding.

Federal and state agencies require that a three-step "sequencing" process be followed when proposing a project that may impact wetlands. The first step of sequencing is that wetlands must be avoided to the extent practicable. Then, if avoidance is not an option, impacts must be minimized to the greatest extent practicable. Finally, if permanent impacts on wetlands are unavoidable, wetland replacement or compensatory mitigation is required to replace lost wetland function.

Atlantic and DETI routed the projects and sited the associated aboveground facilities to avoid wetlands to the greatest extent practicable. Where wetland impacts could not be avoided, Atlantic and DETI would minimize impacts and restore the construction right-of-way by implementing their construction and restoration plans and complying with any conditions of section 404 and 401 permits issued for the projects. Wetland construction procedures are discussed in section 2.3.3.3. Some general construction and restoration procedures included in Atlantic's and DETI's plans (including the FERC *Procedures*) include:

- limiting construction right-of-way width in wetlands to 75 feet, except in areas where site-specific conditions require additional space (FERC approval required);
- locating extra workspaces at least 50 feet from wetland boundaries, except where site-specific conditions warrant otherwise (FERC approval required);
- storing all hazardous materials, including fuels, chemicals, and lubricating fluids, a minimum of 100 feet from any wetland boundary;
- installing erosion and sediment control devices;
- prohibiting parking or refueling of vehicles within 100 feet of a wetland unless the onsite EI determines that there is no practicable alternative;
- preventing the introduction and spread of invasive species;
- using low ground weight equipment or operating equipment on equipment mats in soft soils to prevent rutting;
- cutting vegetation just above ground level, leaving existing root systems in place and limiting the complete removal of stumps and grading activities to those directly over the trenchline (unless required for safety reasons);
- segregating up to 12 inches of topsoil excavated from the trench in non-saturated wetlands and returning it to the appropriate horizon upon backfill of the trench (additional topsoil segregation specifications may be required by state agencies);
- sealing the trench line at upland/wetland boundaries using trench breakers or trench plugs and along the trench bottom if necessary, to maintain wetland hydrology;
- restoring preconstruction contours to the extent practicable to maintain the original wetland hydrology;
- prohibiting the use of lime or fertilizer within wetlands, and using signage to indicate the prohibition of the use of herbicides or pesticides within 100 feet of wetlands or waterbodies;

- ensuring all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species; and

- removing temporary sediment barriers after revegetation and stabilization of adjacent upland areas.

In addition to the measures identified above, the USACE may have additional project-specific conditions for constructing and restoring the project as part of its permitting process. State agencies may have additional conditions. Where differences between federal, state, and local permits exist, Atlantic and DETI would comply with the most stringent condition. These conditions may include (among others):

- the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench;

- the trench cannot be constructed or backfilled in such a manner as to drain waters of the United States; and

- any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing at each waterbody crossing.

Construction activities would temporarily and permanently affect wetland vegetation and habitats, and could temporarily affect soil and hydrology characteristics. Generally, impacts on wetlands would be the greatest during and immediately following construction, with wetland vegetation eventually transitioning back into a community with a function similar to that of preconstruction conditions. Emergent wetlands would typically recover to preconstruction conditions within 1 to 2 years, and scrub-shrub wetlands could take 2 to 4 years, depending on the age and complexity of the system. Impacts on forested wetlands would be much longer, and may include changes in the density, type, and biodiversity of vegetation. Given the species that dominate the forested wetlands crossed by ACP and SHP, recovery to preconstruction state may take up to 30 years or more. Impacts on habitat may occur due to fragmentation, loss of riparian vegetation, and microclimate changes associated with gaps in forest canopy.

During construction, failure to segregate topsoil could result in the mixing of topsoil with the subsoil, which could result in reduced biological productivity or modification of chemical conditions in wetland soils. Considering this could affect the reestablishment and natural recruitment of native wetland vegetation, wetland soils would be restored to their original profile to the extent possible. Compaction and rutting of soils during construction could result from the movement of heavy machinery and the transportation of pipe sections, altering natural hydrologic patterns of the wetlands and potentially inhibiting seed germination and regeneration of vegetation species. Limits to the type of equipment (e.g., low ground pressure equipment, trenching and backfilling equipment) allowed to access wetland areas and the use of weight dispersing devices such as timber mats would help to proactively address compaction and rutting issues. The discharge of stormwater, trench water, or hydrostatic test water could increase the potential for sediment-laden water to enter wetlands and cover native soils and vegetation. Prudent selection of discharge locations and the use of BMPs for dewatering activities would minimize the impact of dewatering. Finally, construction clearing activities and disturbance of wetland vegetation could also temporarily affect the wetland’s capacity to buffer flood flows and/or control erosion. Wetland hydrology would be maintained by installation of trench breakers at the wetland/upland boundary, sealing the trench bottom where necessary, and by restoring wetlands to original contours without adding new drainage features that were not present prior to construction. Impacts on water quality may include changes in temperature, biochemistry, or water chemistry; sedimentation or release of hazardous materials (e.g., fuels, lubricants); addition of nutrients; and turbidity.

Secondary and indirect effects are impacts on adjacent or other nearby environmental resources, such as the sedimentation of water resources down-gradient of disturbed areas or habitat loss due to microclimate changes following clearing of forested vegetation that could result from the principal pipeline construction activities. Atlantic and DETI propose measures in their construction and restoration plans to prevent secondary and indirect impacts on adjacent wetland areas. These include such measures as minimizing the length of open trench at any given time, using HDD installation methods in sensitive areas, installing trench breakers or sealing the trench bottom to maintain hydrology, employing erosion and sediment control measures to prevent discharge of sediment into adjacent wetlands and waterbodies, and limiting refueling and storage of hazardous materials. In addition, where secondary and indirect effects cannot be avoided or minimized, they would be mitigated as part of applicable USACE and state wetland impact mitigation requirements described below.

Operation of ACP and SHP would require periodic vegetation maintenance over the pipeline centerline. These activities would include annual (or more frequent) vegetation maintenance of a 10-foot-wide strip centered over the pipeline to maintain in an herbaceous state. Because herbaceous wetland vegetation would not generally be mowed or otherwise maintained, it would therefore not be permanently affected. Scrub-shrub wetlands would be allowed to regenerate but would be affected by maintenance of the 10-foot-wide strip. Most of the permanent impacts on wetland vegetation would be in forested wetlands where trees within 15 feet of the pipeline centerline would be selectively cut and removed once every 3 years. Therefore, by maintaining the right-of-way and limiting revegetation of a portion of scrub-shrub and forested wetlands, some of the functions (primarily habitat) of these wetlands would be permanently altered by conversion to scrub-shrub and/or emergent wetlands.

Aquatic Invasive Plant Species

The introduction of aquatic invasive species has the potential to change the health and natural diversity of watersheds across the country, and the spread of such species has become an issue of national importance. There are widespread populations of many noxious weeds and other invasive plant species in each state in which ACP and SHP would be constructed (see section 4.4.4). Atlantic and DETI would implement the measures in their *Invasive Plant Species Management Plan*. These measures are designed to prevent the introduction and spread of invasive plants during construction and operation through identification, pre-treatment control (application of herbicide, hand pulling, or mechanical measures such as mowing), cleaning equipment (including timber mats) prior to arrival at the construction site, segregating topsoil in all infested areas, using certified weed-free erosion control materials, routine monitoring, and restoration and reseeding following installation of the pipeline, all of which would promote the establishment of desirable plant species and deter the spread of invasive plant species. Due to the content of the *Invasive Species Management Plan* and the requisite vegetation monitoring, we conclude that Atlantic and DETI would adequately minimize the spread of aquatic invasive plant species.

4.3.3.6 Project-specific Impacts and Mitigation

As identified in table 4.3.3-3, construction and operation of ACP would temporarily and permanently impact 795.4 and 243.0 acres of wetland, respectively. Construction and operation of SHP would temporarily and permanently impact 2.8 and 0.9 acres of wetland, respectively. Of the approximately 227 acres of permanent forested wetland impacts, 98 percent would be considered type conversions (e.g., forested areas that are cleared and converted to emergent wetlands), and would occur as a result of vegetation maintenance during operations. There would be approximately 6.9 acres of permanent wetland fill on ACP, and less than 0.5 acres on SHP (see appendix L).

TABLE 4.3.3-3

Summary of Wetland Impacts for the Atlantic Coast Pipeline and Supply Header Project

State/Facility	Type [a]	Crossing Length (feet)[b]	Wetland Area Affected During Construction (acres)[c]	Wetland Area Affected During Operation (acres)
ATLANTIC COAST PIPELINE				
Pipeline Facilities	PEM	53,908	83.6	0.0
	PSS	50,222	93.7	11.6
	PFO	323,910	596.1	224.4
	Estuarine	4,104	4.7	0.0
Pipeline Subtotal		**432,143**	**778.1**	**236.1**
Aboveground Facilities	PEM	N/A	1.0	0.1
	PSS	N/A	1.3	<0.1
	PFO	N/A	0.6	0.1
Aboveground Facilities Subtotal		**N/A**	**2.9**	**0.3**
Access Roads	PEM	7,213	5.1	3.2
	PSS	3,597	2.4	1.1
	PFO	7,311	6.5	1.9
	PUB	96	0.1	0.1
	Estuarine	591	0.4	0.4
Access Roads Subtotal		**18,807**	**14.4**	**6.6**
Atlantic Coast Pipeline Total		**450,951**	**795.4**	**243.0**
SUPPLY HEADER PROJECT				
Pipeline Facilities	PEM	440	1.5	0.0
	PSS	65	0.1	<0.1
	PFO	499	0.9	0.4
Pipeline Subtotal		**1,003**	**2.4**	**0.5**
Aboveground Facilities	PEM	N/A	<0.1	<0.1
	PSS	N/A	0.0	0.0
	PFO	N/A	0.0	0.0
Aboveground Facilities Subtotal		**N/A**	**<0.1**	**<0.1**
Access Roads	PEM	400	0.3	0.3
	PSS	0	0.0	0.0
	PFO	166	0.1	0.1
Access Roads Subtotal		**566**	**0.4**	**0.4**
Supply Header Project Total		**1,570**	**2.8**	**0.9**
TOTAL WETLAND IMPACTS COMBINED		**452,522**	**798.2**	**243.9**

[a] Wetland classification according to Cowardin et al. (1979).
[b] N/A = wetlands not crossed by the centerline but within the construction workspace.
[c] Construction impacts include those within the operational footprint as well as those within temporary workspaces.
Note: Sum of addends may not equal total due to rounding.

4.3.3.7 Modifications to the FERC Procedures

Atlantic's and DETI's construction and restoration plans, along with FERC *Procedures*, specify that the construction right-of-way in wetlands should be limited to 75 feet in width and extra workspace should not be within 50 feet of wetlands except where an alternative distance has been requested by Atlantic and DETI and deemed acceptable by FERC. For wetlands with extenuating circumstances, Atlantic has requested that the construction right-of-way with be expanded beyond 75 feet, and Atlantic and DETI have requested extra workspace within the 50-foot setback. Atlantic's requested modifications to the FERC *Procedures* are detailed in section 2.3 and tables 2.3.1-2 and 2.3.1-3. As discussed in section 2.3, we have found Atlantic's and DETI's request for modifications acceptable. However, as noted in section 2.3, additional modifications appear to be proposed but have not been identified or justified by Atlantic and DETI. These modifications cannot be deemed acceptable until appropriate justification is provided and we concur with the justification.

4.3.3.8 Wetland Mitigation

The USACE and designated state agencies require mitigation for unavoidable wetland impacts to preserve no net loss of wetland function. Although final mitigation (e.g., banking credits, on-site mitigation, in-lieu fees, or permittee responsible mitigation) requirements have not yet been determined for the projects, Atlantic and DETI would be required to complete compensatory mitigation through the section 404 process of the CWA with the USACE. Atlantic and DETI, in consultation with each USACE District office, would prepare project-specific wetland mitigation plans to maintain no net loss of wetlands and to adequately replace lost functions. As a part of the federal and state permitting processes, written approval of the mitigation plan would be obtained from the USACE and appropriate state agencies prior to construction. Where differences exist in federal, state, and local approaches to determining mitigation ratios, Atlantic and DETI would prepare specific mitigation plans to ensure compliance with the more stringent ratio. However, because these mitigation plans have not been finalized, **we recommend that:**

- **Prior to construction, Atlantic and DETI should file with the Secretary a copy of its final wetland mitigation plans and documentation of USACE approval of the plans.**

4.3.3.9 Wetlands on Federal Lands

Based on current information filed by Atlantic and as detailed in table 4.3.3-4, approximately 0.1 acre of forested and scrub-shrub wetlands would be temporarily and permanently impacted on federal lands. However, the GWNF has indicated that about 0.4 acre of wetland may be impacted on its lands. The types and degree of impacts that could occur on forested, scrub-shrub, and emergent wetlands on federal lands are similar to the impacts that are summarized in section 4.3.3.5. Beyond the construction measures contained in the *COM Plan*, Atlantic incorporated additional measures identified in the LRMPs of both national forests. These standards and guidelines have also been incorporated into the *COM Plan*. However, the FS has acknowledged that additional standards and guidelines would be necessary on NFS lands, and further revisions to the *COM Plan* are required. Additionally, the FS believes it is unclear if erosion control and rehabilitation measures would meet Forest Plan Standards. Thus, the FS believes effects on wetland resources on NFS lands are unknown pending incorporation of necessary mitigation measures into the *COM Plan*.

4.3.3.10 Conclusion

Construction of ACP and SHP would impact approximately 798 acres of wetland. PFO wetlands comprise the majority of wetland impacts, accounting for 76 percent of all wetlands impacted, and 74 percent of the permanent wetland impacts. However, nearly all the permanent forested wetland impacts would be considered type conversions (e.g., conversion of forest to scrub-shrub or emergent wetland). Based on Atlantic's and DETI's measures to avoid, minimize, and mitigate wetlands, along with adherence to their construction and restoration plans; the FERC *Procedures*; and federal, state, and local permit requirements, we have determined that ACP and SHP would not significantly impact wetlands.

TABLE 4.3.3-4

Summary of Wetland Types Affected by Construction and Operation of the Atlantic Coast Pipeline on Federal Lands

Federal Land Unit	Cowardin Classification	Wetland Crossing Length (Feet) [a]	Temporary Construction Impact (acres) [b]	Operational Impact (acres) [c]
MNF	PEM	0	<0.1	0.0
GWNF	PEM	0	<0.1	0.0
	PSS	0	<0.1	<0.1
	PFO	67	0.1	<0.1
BRP	None	0	0.0	0.0
ACP Total		**67**	**0.1**	**<0.1**

[a] A value of 0 indicates that the wetland is not crossed by the pipeline centerline.

[b] Temporary wetland impacts associated with the construction right-of-way.

[c] Operational impacts are associated with scrub-shrub and forested wetlands. Operational requirements allow a 10-foot-wide corridor centered over the pipeline to be maintained in an herbaceous state, and for the removal of trees within 15 feet on either side of the pipeline. To determine conversion impacts on scrub-shrub wetlands, a 10-foot-wide corridor centered over the pipeline was assessed. A 30-foot-wide corridor centered over the pipeline was assessed for forested wetlands.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

4.4 VEGETATION

4.4.1 Vegetation Resources

Vegetation resources were characterized based on information and data from state wildlife plans, which focus on local and regional geographic scales to identify natural communities and the wildlife habitat they provide. Vegetation community classification systems and descriptions vary slightly by state. Appendix Q describes the dominant vegetation and site characteristics of each state's affected vegetation community type, and quantifies the impacts from the construction and operation of ACP and SHP, respectively. Section 4.4.3 describes the impacts of ACP and SHP by National Land Cover Database (NLCD) cover type (Homer et al., 2015). Table 4.4.1-1 provides a description of each NLCD cover type.

Agricultural areas and developed lands are not discussed in this section, and can be found in section 4.8. Wetland vegetation communities and open water are described in section 4.3.3. Section 4.4.2 provides detailed information on special concern vegetation communities and section 4.7 provides sensitive plant species information (e.g., federally and state sensitive species). The following sections provide a summary of these vegetation communities, focusing on those communities that have a limited distribution, provide valuable wildlife habitat, and/or are more sensitive to disturbance.

4.4.1.1 West Virginia

Vegetation in West Virginia in both the ACP and SHP project areas is primarily forested community types. Predominant natural habitats crossed by ACP and SHP in West Virginia include Northern hardwood forests (638.3 acres), Dry oak (-pine) forests (749.6 acres), and Dry-mesic oak forests (492.9 acres) (see appendix Q). Northern hardwood forests include upland deciduous and mixed deciduous-evergreen forests at high elevations in the Allegheny Mountains ecoregion. Some stands may include or be dominated by Eastern Hemlock. The mixed hemlock/hardwood forests have probably increased in more recent years as hemlock gains dominance in deciduous stands, but this trend may reverse if hemlock wooly adelgid takes hold in the higher elevations. Red spruce is often present but not abundant in the canopy, however, red spruce is regaining dominance in many areas due to human activities. Dry oak (-pine) forests include deciduous and mixed evergreen-deciduous forests that occur throughout the state, except for the highest elevations. Dry oak (-pine) forests include a large component of oak (chestnut, scarlet, black, white), red maple, and Eastern white pine. Dry-mesic oak forests are the most abundant natural habitats in the state and, like Dry oak (-pine) forests, occur in all but the highest elevations. Dry-mesic oak forests include a large component of oak (red oak, chestnut oak, white oak, and black oak) and subsets of oak-hickory forests that include pignut, mockernut, and shagbark hickories. Most of the Dry oak (-pine) and Dry-mesic oak forest habitat expanded following fires during the logging boom around 1900. Many stands are now decreasing in size because of human activities and gradual mesophication, however, fire and logging continues to create and maintain these habitats in many areas of the state. On public land, prescribed fire and silvicultural treatments are increasingly used to promote oaks and pines, and repeated arson, especially in the Cumberland Mountains Ecoregion, creates and maintains these habitats even on relatively mesic sites. Forestry, mining, and other development also continue to reduce and fragment these forests, and alter their composition. Regardless, maintenance of large continuous stands and old growth continues to be a priority for all forested landscapes (WVDNR, 2015a). See sections 4.4.2 and 4.4.8 for discussions on old growth forests.

TABLE 4.4.1-1

Summary of National Land Cover Database Cover Types Crossed by the Atlantic Coast Pipeline and Supply Header Project

NLCD Cover Type	Percent Cover		Description of Cover Type within ACP and SHP
	ACP	SHP	
Deciduous Forest	43.3	24.7	Deciduous forests are areas dominated by trees that are generally greater than 5 meters tall with more than 20 percent of total vegetation cover. More than 75 percent of the tree species are deciduous. Within ACP and SHP project areas, this includes predominately includes different oak forest community types, and other mesophytic (moist) and hardwood communities.
Coniferous (Evergreen) Forest	6.0	0.0	Coniferous (evergreen) forests are dominated by trees generally greater than 5 meters, with more than 20 percent vegetation cover, and where more than 75 percent of the trees are coniferous. In the ACP project area, there are few coniferous cover type communities, including red spruce forests, montane pine forest and woodland, and longleaf pine savanna and woodland. No coniferous communities are affected by SHP.
Mixed Forest	31.0	72.2	Mixed forests are areas dominated by trees generally greater than 5 meters tall, and have greater than 20 percent of total vegetation coverage, but where neither deciduous nor coniferous species are greater than 75 percent of total tree cover. Within ACP and SHP project areas, this includes northern hardwood forests, oak-pine forests, and pine-oak woodlands. This could also include managed tree plantation forests.
Scrub-Shrub	5.5	1.0	The shrub-scrub cover type includes areas dominated by shrubs less than 5 meters tall with shrub canopy greater than 20 percent of the total vegetation. This includes true shrubs, young trees in early successional stage, or trees stunted from environmental conditions. In ACP and SHP project areas, there is limited scrub-shrub habitat that includes anthropogenic shrubland and grassland, and successional shrubland that is regenerating from forest clear-cuts.
Grassland / Herbaceous and Herbaceous / Palustrine Emergent Wetlands	4.1	0.0	Grassland / herbaceous cover type are areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. This includes the emergent herbaceous wetlands that consist of perennial vegetation where the soil substrate is periodically saturated with or covered with water, and palustrine emergent wetlands (persistent) that include tidal and nontidal wetlands dominated by persistent emergent vascular plants and mosses or lichens. In the ACP project area, this includes alkaline glades and woodlands, freshwater marshes, and early successional areas that are regenerating from clear-cuts. No grassland / herbaceous or palustrine/emergent herbaceous wetland communities are affected by SHP.
Barren Land	0.1	0.0	Generally, barren land represents areas where vegetation accounts for less than 15 percent cover. Within ACP and SHP project areas, this includes acidic rock, outcrops, cliffs, and talus. No barren land communities are affected by SHP.
Woody Wetlands	10.0	2.2	Woody wetlands are areas where forested or shrubland vegetation accounts for greater than 20 percent cover and soil or substrate is periodically saturated or covered with water. In ACP and SHP project areas, this includes small stream riparian and river floodplains, High Allegheny forested wetlands, floodplain forests, and shrub-dominated or forested swamp communities.

See appendix Q for construction and operation impacts by state vegetation classification and corresponding NLCD categories.

Note: Due to rounding, some addends may be off by 0.1.

Montane red oak forests, dry calcareous forests, woodlands, and glades, and acidic rock outcrops, cliffs, and talus vegetation community types have restricted distributions. Montane red oak forests are only found on the highest ridges in the Ridge and Valley and Allegheny Mountain ecoregions along the border with Virginia where they are found in long continuous patches. The dry calcareous forests, woodlands, and glades vegetation communities are only found on exposed calcareous bedrock or limestone beds. The dry calcareous forest communities have declined due to agricultural, forestry, and limestone development and continue to be threatened by non-native plants. The acidic rock outcrops, cliffs, and talus community type are restricted to certain geological formations concentrated in certain areas, such as cliff-lined valleys, boulder fields, and high elevations. These community types support rare species (WVDNR, 2015a). Impacts related to karst features and the wildlife habitat that they provide are discussed in section 4.5.2.4.

ACP would also cross red spruce forest. Red spruce forests are estimated to have originally covered more than half a million acres in West Virginia. Logging and burning from 1880 to 1920 reduced the spruce forest to a fraction of its former size. Now the region is a patchwork of red spruce, northern hardwoods, and cleared habitats in various stages of succession. In West Virginia, red spruce forests and woodlands grow in the Allegheny Mountain region. At the state level, 240 rare species have been documented within West Virginia's red spruce ecosystem (Byers, 2010). Based on the West Virginia Terrestrial Habitat Map (WVDNR, 2015b), construction of ACP would impact 6.2 acres of red spruce forest between MPs 63.6 and 71.7. While the map provides a broad-scale model for the entire state, it does not capture data at finer scales. For example, some areas of red spruce forest on the MNF would be crossed by ACP and are not represented in the data. Section 4.4.6 discusses these areas on the MNF.

River floodplain and small stream habitats represent 87.8 acres within the ACP and SHP project area. Riparian habitats have seen and continue to decline due to damming and impoundments, forestry, conversion to agriculture and developments, and invasion of non-native species (WVDNR, 2015a).

4.4.1.2 Virginia

Central and western Virginia is dominated by mixed hardwood and conifer forests. Most of these forests are mature, and the VDGIF identifies the need to both conserve intact forest patches to discourage fragmentation and development, and maintain balanced age class and tree diversity to maintain forest health. Predominant natural habitats crossed by ACP in Virginia include Dry Oak-Pine Forest/Central Appalachian Southern Piedmont (873.7 acres), Northeastern Interior Dry-Mesic Oak Forest (839.7 acres), and Southern Piedmont Mesic Forest (538.7 acres). Central Appalachian and southern piedmont dry oak-pine forests are an oak or oak-pine forest with a mix of drought tolerant oaks and pines in Virginia. Dry oak-pine forest in the southern piedmont was once the dominant matrix-forming forest of the piedmont, and now is composed of large patches of post-clearing successional forests in which pines often dominate for many decades. Northeastern Interior Dry-Mesic Oak Forests are an oak-dominated, mostly closed canopy forest that occurs as a matrix type through northern Virginia. Southern Piedmont Mesic Forests are dominated by trees that favor conditions of moderate moisture such as sweetgum, white oak, red oak, tuliptree, and basswood, with American beech most prominent, and occasional conifers (Anderson et al., 2013).

In contrast, open habitats, such as grassland/herbaceous areas are not as widely distributed within the Commonwealth of Virginia, but are important to many wildlife species. Impacts to these vegetation community types have contributed to the decline of species, such as the loggerhead shrike, field sparrow, and monarch butterflies (VDGIF, 2015b).

Protection of karst has also been identified as a conservation action in northwestern Virginia where these features are predominately found (i.e., Highland, Bath, Augusta, and Nelson Counties). The vegetation communities found overlying karst features could include forest, grassland/herbaceous, or barren land (VDGIF, 2015b). Because these habitats are largely subterranean, the potential impacts associated with these areas are discussed in section 4.5.2.4 in reference to wildlife habitat.

In southeastern Virginia (i.e., portions of Greensville and Southampton Counties, and Cities of Suffolk and Chesapeake), conservation efforts are more focused on maintaining non-tidal and tidal wetland areas (included in the woody and herbaceous wetland NLCD cover types). These wetland communities support many species, including the marsh rabbit, carpenter frog, spotted turtle, marbled godwit, snowy egret, and a variety of rail species (VDGIF, 2015b). Impacts on wetlands are discussed in more detail in section 4.3.3.

Riparian habitat (included in woody wetland NLCD cover type) has also seen a decline from its historic distribution across the state. The VDGIF have identified maintenance of riparian buffers, and implementation of sediment erosion and control practices as conservation measures important to protecting aquatic and riparian habitats and the wildlife species that use them (VDGIF, 2015b).

4.4.1.3 North Carolina

The conservation of large intact forest patches is a priority for the oak forest community types (deciduous forests) found in the Atlantic Coastal Plain and Piedmont ecoregions of North Carolina. Oak dominated communities are found throughout the Atlantic Coastal Plain, but are no longer common except in small patches, and their condition has degraded over the last century. Fragmentation of these communities has contributed to the decline of many wildlife species. Total acreage of mature hardwood and pine forests have been declining in recent years due to urban development and agriculture. Most of these forests have also been logged or clear-cut within the past 300 years. Controlled burning is important to maintaining and improving structural heterogeneity of these forest types, in addition to the control and eradication of invasive and noxious plants and insects (North Carolina Wildlife Resources Commission [NCWRC], 2015a).

Predominant vegetation communities crossed by ACP in North Carolina include Atlantic Coastal Plain Upland Longleaf Pine Woodland (395.5 acres) and Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (357.5 acres). Longleaf pine communities were once the most abundant Atlantic Coastal Plain habitat, but now exist in only three percent of its previous range and is thought to be one of the most endangered habitats in the United States. Urban development and lack of fire continue to threaten the remaining forests. These communities support the endangered red-cockaded woodpecker, coral snake, and eastern diamondback rattlesnake, the threatened eastern tiger salamander, and Carolina gopher frog, in addition to several state sensitive species. ACP would cross both upland longleaf pine woodland (coniferous forest) and wet longleaf pine savanna and flatwood communities (woody wetlands) on the Atlantic Coastal Plain. These wet communities are important to reptiles and amphibians, particularly where ponds are embedded in savannas or flatwoods (NCWRC, 2015a). The Southern Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest system includes oak-dominated forests (white oak, Southern red oak, water oak, and post oak) with sweetgum, and mockernut and pignut hickories (NatureServe, 2017).

There are several floodplain forest (woody wetlands) communities crossed by ACP, including blackwater, and brownwater river floodplains. Several sensitive natural communities, such as cypress gum swamps and bottomland hardwoods, fall into this category and would be crossed by ACP as described in sections 4.3.3.3 and 4.4.2.3. Direct loss and habitat fragmentation, and changes to hydrology have contributed to the loss or degradation of these floodplain forests in both the Piedmont and Atlantic Coastal Plain regions of the state. These habitats serve as wildlife for many songbird species, reptiles, amphibians, and small mammals. Switch cane (*Arundinaria gigantea*) communities are associated with this community type and have been drastically reduced throughout the Piedmont region. These communities are maintained by fire or other periodic disturbance; these communities support the threatened Rafinesque's big-eared bat, and several sensitive species including Swainson's warbler, and timber rattlesnake (NCWRC, 2015a).

ACP would also cross peatland pocosin and canebrake communities (woody wetlands) within the Atlantic Coastal Plain. Pocosin are peatland communities found in the Atlantic Coastal Plain, and occur on peatlands of poorly drained interstream flats, peat-filled Carolina bay depressions and swales, or along small headwater streams on the flat bottoms or extending up adjacent seepage slopes. These communities are extremely acidic and nutrient poor. Pocosins are particularly important for wintering birds because they produce large quantities of berries. Atlantic white cedar can sometimes dominate in these communities, and is known to occur in the Great Dismal Swamp. These communities also benefit from the increased use of prescribed fire to increase heterogeneity. Specialized types of pocosin, such as those dominated by white cedar stands, would benefit from more extensive protection (NCWRC, 2015a).

Clay-based Carolina Bay wetlands (herbaceous wetlands) would be crossed by ACP; these bays are particularly abundant in Robeson, Hoke, and Scotland Counties. They typically dry up in the summer and are found in an open canopy of cypress. These are important breeding sites for amphibians because they are often ephemeral and ideal habitat for amphibians, and rarely contain fish (NCWRC, 2015a).

4.4.1.4 Pennsylvania

Forests are the dominant land cover in Pennsylvania. Most of the state is second- or third-growth forest; only a few thousand acres of unharvested forest remain in the state. The Appalachian (hemlock)-northern hardwood forest is the dominant forest system in Pennsylvania and the most abundant community type in the SHP project area. The Appalachian (hemlock)-northern hardwood forest consists of deciduous forest and mixed forest communities dominated by oak, maple, beech, hickory, black walnut, and other hardwoods. Hemlock may be dominant in some communities.

4.4.2 Vegetation Communities of Special Concern or Management

Atlantic and DETI consulted with state resource agencies to identify unique, sensitive, and protected vegetation communities, and natural areas that could be affected by the projects. Vegetation communities of special concern or management were not identified along the SHP route. Potential wildlife and wildlife habitat impacts to State Forests and Wildlife Management Areas are discussed in section 4.5.2. Section 4.4.7 discusses Vegetation Communities of Special Concern on federal lands, and section 4.7 provides sensitive plant species information (e.g., state sensitive species).

We received comments from The Nature Conservancy and other affected landowners regarding potential impacts on old growth forests along the ACP and SHP routes. Old growth forests are limited in distribution due to past natural events and human disturbance. Old growth varies by forest type, climate, site, conditions, and disturbance regime. The FS has established guidelines for defining old growth that uses age, disturbance, basal area, and tree size as criteria for 16 community types. Old growth communities may serve as optimal habitat for some species, and provide recreational research, educational, and cultural and spiritual value (FS, 1997).

Databases of old growth stands in the states crossed by ACP and SHP are not currently available; therefore, for the purposes of this EIS, the assessment of the miles, acreages, and sizes of trees to be cleared within the pipeline construction and permanent rights-of-way is based on a desktop analysis using 2015 aerial photography and recent satellite photography. In addition, the FS analyzed forest inventory data to determine the impact on "possible old growth" forests from ACP on NFS lands. Results of these analyses are provided in sections 4.4.8 and 4.8 (GWNF Amendment, Part 5). Atlantic and DETI would conduct timber cruises and old growth surveys where requested by the landowner, including NFS lands, prior to construction.

Table 4.8.1-5 lists the estimated crossing lengths for late seral (i.e., mature forest at climax stage), mid-seral (i.e., younger forest in transition), and recently harvested forest lands. Based on the desktop analysis, ACP and SHP would cross a total of 361.3 miles of late seral forest (330.5 miles on ACP and 30.8 miles on SHP). There is likely a large range of ages between the late and mid-seral forests. In determining impacts based on tree size, large trees were anything over roughly 50 feet in height with a mature spreading crown. Table 4.8.1-6 lists the tree types that occur along ACP and SHP pipeline routes. This table indicates that a total of 4,914.6 acres of large trees is present within the construction workspace (4,503.9 acres within ACP construction workspace and 410.7 acres within the SHP workspace), and a total of 2,681.7 acres of large trees is present in the permanent right-of-way (2,495.0 acres within the ACP permanent right-of-way and 186.7 acres within the SHP right-of-way). Construction of ACP and SHP would convert mature and/or old growth forests to herbaceous habitat, while the balance of the acres would be converted to an early successional condition. See section 4.8 for further discussion of preconstruction timber cruises, timber removal process, and the mitigation measures that would be implemented. Section 4.4.8 discusses old growth on NFS lands.

4.4.2.1 West Virginia

Potential wildlife and wildlife habitat impacts associated with the Lewis Wetzel WMA are discussed in section 4.5.2.1.

Seneca State Forest

The proposed AP-1 mainline crosses approximately 4.8 miles of the Seneca State Forest in Pocahontas County, West Virginia. The crossing of the Seneca State Forest occurs between approximate AP-1 MPs 76.9 and 79.2 and AP-1 MPs 79.4 and 80.5. The forest is owned by WVDNR and managed by the West Virginia State Parks (WV State Parks) and West Virginia Division of Forestry (WVDOF) (WV State Parks, 2016a). The forest encompasses 11,684 acres, which are used for hiking, fishing, hunting, and camping.

During 2016 field surveys, Atlantic identified a population of small whorled pogonia (*Isotria medeoloides*), a federally threatened species, on Seneca State Forest property. While the population is outside of the construction right-of-way and would not be directly impacted, Atlantic is currently coordinating with the FWS and WVDNR to determine potential indirect impacts and the appropriate conservation measures to avoid and minimize impacts to this population (refer to section 4.7.1.14).

In correspondence with Atlantic, the WVDOF recommended soil amendments and cultural practices to rehabilitate and restore the right-of-way along the Seneca State Forest. They also recommended the use of different seed mixes for areas with slopes greater than and less than 15 percent slopes, and recommended seed mixes include wildlife-friendly forage species (forbs and pollinator species). At the request of the WVDOF, Atlantic recently drafted an Order 1 soil survey to further refine seed mixes to be used within the Seneca State Forest. Upon review of the Order 1 soil survey, the WVDOF will provide recommended seed mixes to be used along the right-of-way. Because Atlantic's *Restoration and Rehabilitation Plan* (see appendix F) does not yet incorporate the WVDOF recommended mitigation measures or seed mixes for the Seneca State Forest, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the**

Director of OEP, a revised *Restoration and Rehabilitation Plan* that incorporates recommended mitigation measures and seed mixes for Seneca State Forest based on consultation with the WVDOF.

Kumbrabow State Forest

Like the Seneca State Forest, Kumbrabow is owned by the WVDNR and managed by the West Virginia State Parks and WVDOF. The forest encompasses 9,474 acres, which provide recreation and watershed protection, while practicing the principles of forestry and wildlife management (WV State Parks, 2016b).

Portions of existing roads that lead into the Kumbrabow State Forest would be used to access the AP-1 mainline at MPs 53.7 and 54.4 in Randolph County, West Virginia. Access roads 04-002-B001.AR6.1 (MP 53.7) and 04-002-B001.AR9 (MP 54.4) would be improved for construction, including the addition of gravel where needed and regrading. No habitat for federally listed plants was identified along the access roads during the 2016 desktop review; therefore, no plant-specific surveys are planned or have been requested by the WVDNR or WVDOF.

4.4.2.2 Virginia

Potential wildlife and wildlife habitat impacts associated with the James River WMA are discussed in section 4.5.2.3.

Natural Area Preserves

The VDCR, Natural Heritage Program (NHP) identified and provided information on five Natural Area Preserves within a 4-mile buffer area around the proposed ACP; however, no Natural Area Preserves would be crossed by ACP. As such, we conclude ACP would not affect Natural Area Preserves in Virginia.

Conservation Sites

Natural Heritage Conservation Sites represent key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support. Terrestrial conservation sites are boundaries that contain one or more rare plant, animal, or natural community. Sites are designed to include the element and, where possible, the species associated habitat, and buffer or other adjacent land needed for the element's conservation (VDCR, 2016a). ACP would cross 16 Conservation Sites in Virginia (see table 4.4.2-1).

We received comments regarding potential impacts on sensitive forest landscapes in Virginia, particularly the Shenandoah Mountain Trail Conservation Site, Signal Corps Knob, the Laurel Fork Conservation Site, Lyndhurst Conservation Site, and the Spruce Creek Tributary Conservation Site. The Shenandoah Mountain Trail Conservation Site associated with Shenandoah Mountain has been avoided by adoption of the GWNF6 alternative route. ACP would not cross Signal Corps Knob, Laurel Fork, or Lyndhurst Conservation Sites.

The proposed pipeline crosses the Spruce Creek Tributary Conservation site between AP-1 MPs 162.1 and 162.6. The conservation site was established by the VDCR to protect a central Appalachian low-elevation acidic seepage swamp. While the currently proposed route does not cross the seepage swamp, the route crosses the protection buffer, or conservation site, around the swamp.

While the VDCR has recommended avoidance of all conservation sites crossed, the VDCR has emphasized avoidance of the Handsom-Gum, Branchville, and Emporia Powerline Bog Conservation Sites to conserve documented natural heritage resources. The VDCR requested Emporia Powerline Bog be completely avoided, potentially by moving the pipeline north of the current crossing beyond the access road area and exploring different alternatives for the crossing of Interstate 95. While Atlantic acknowledged the VDCR's recommendation for avoidance, and incorporated a minor route modification at the Emporia Powerline Bog site to reduce impacts and avoid direct impact on the rare plant communities, complete avoidance was not considered practicable due to the orientation and size of the Conservation Sites. Accordingly, Atlantic made efforts to minimize habitat fragmentation by collocating the pipeline adjacent to existing utility rights-of-way at the Handsom-Gum and Branchville Conservation Sites. In a letter to the VDCR dated July 15, 2016, Atlantic proposed avoiding direct impacts to the element occurrences and contends that construction of ACP would expand suitable habitat for and encourage the spread of rare plants beyond the existing occurrences with proper management. Atlantic requested concurrence from the VDCR. To date, the VDCR has not provided concurrence with Atlantic's proposed avoidance and minimization concept and consultations are ongoing. Additionally, the VDCR recommended surveys on the conservation sites. In 2015 and 2016, Atlantic field surveys noted the presence of rare plant species within several of the conservation sites (see table 4.4.2-1).

The VDCR also requested a hydrologic study plan be completed for the Handsom-Gum and Emporia Powerline Bog Conservation Sites. The VDCR is concerned that changes in the quantity of groundwater flow to wetlands, because of pipeline construction, would impact rare plant populations. Atlantic submitted a *Hydrologic Study Plan* in October 2016 to the VDCR and requested concurrence with the *Study Plan*. In a letter dated January 30, 2017, the VDCR commented on the *Study Plan* and requested avoidance of documented natural heritage resources associated with the Handsom-Gum and Emporia Powerline Bog Conservation Sites during field investigations. In a response letter dated February 15, 2017, Atlantic responded to the VDCR's comments and questions, but did not indicate if documented natural heritage resources would be avoided during field investigations. Atlantic continues to consult with the VDCR regarding potential impacts and mitigation measures to minimize impacts on Conservation Sites and Virginia protected plant species. Atlantic stated it would complete the hydrologic studies and file the results with the VDCR and FERC in the second quarter 2018. Except for American ginseng (Virginia state threatened species), the remaining plant species noted as observed in table 4.4.2-1 that would be affected by proposed construction and operation activities are Virginia sensitive species, but are not state-listed. Atlantic has committed to developing an *American Ginseng Relocation Plan* to relocate directly affected plants from the construction workspace prior to construction in accordance with GWNF BMPs. This plan would be approved by the FS prior to clearing. Additional information on Virginia sensitive and state-listed species can be found in table S-2 of appendix S.

4.4.2.3 North Carolina

Natural Areas

ACP crosses 12 natural heritage natural areas (NHNA) in North Carolina. NHNAs include terrestrial and aquatic sites that are of special biodiversity significance. Each NHNA is given a Representation Rating (R-Rating) and a Collective Rating (C-Rating). R-Ratings indicate a natural area's potential to contribute to a collection of the best locations for each tracked element within the state. C-Ratings evaluate the conservation value of each natural area based on the number of tracked elements present and the rarity of those elements, weighted in terms of both global and statewide imperilment of the element (North Carolina Natural Heritage Program [NCNHP], 2015). Construction of ACP would temporarily affect 32.6 acres and permanently affect 16.4 acres of NHNAs (see table 4.4.2-2).

TABLE 4.4.2-1

Virginia Conservation Sites Crossed by the Atlantic Coast Pipeline

Project Segment/Site Name	B-rank [b]	Natural Heritage Resource of Concern	Construction Impacts (acres)	Operational Impacts (acres)
AP-1 Mainline				
NFS Road Site (GWNF) [a]	*B3*	***Small whorled pogonia*** [c]***, American ginseng*** [c]***, potential southern water shrew habitat*** [c]	*5.1*	*1.9*
Windy Cove (GWNF)	*B2*	*Significant karst and karst fauna*	*95.1*	*34.2*
Big Cedar Shale Barren [e]	B2	Central Appalachian Shale Barren (southern type), Shale Barren Rock Cress, Millboro leatherflower	0.2	<0.1
Cochran's Cave	B4	Significant cave, underground spring, potential for cave-limited species such as Madison cave isopod	11.1	3.5
Campbell's and Grove Farm Ponds	B2	Valley doll's daisy	12.1	4.7
Spruce Creek Tributary	B3	Central Appalachian Low-Elevation Acidic Seepage Swamp	7.1	2.6
Nottoway Basin	B2	Michaux's sumac, **Roanoke logperch** [c], **Atlantic pigtoe** [c]	7.2	2.6
Emporia Powerline Bog	B5	Slender nutrush, **pine barren sandreed** [c]; small white-fringed orchid, **branched hedge-hyssop** [c], **dense-flowered camas** [c], small bunched beaksedge, fringed meadow beauty, slender rattlesnake-root, **pink sundew** [c, d], **Rafinique's seedbox** [c, d]	4.2	2.0
Upper Fontaine Creek Habitat Zone	B5	Baldwin's spikerush; Bald Cypress – Water Tupelo Brownwater Swamp, Coastal Plain Bottomland Forest (Brownwater Low Terrace Type)	30.2	13.8
AP-3 Lateral				
Lower Fontaine Creek	B3	Reclining bulrush, ravenfoot sedge, lesser marsh St. John's-wort, **tidewater mucket** [c], **triangle floater** [c], yellow lampmussel, eastern lampmussel	1.9	1.2
Branchville Powerline	B5	**Gaping panic grass** [c], **southern bog goldenrod** [c]	3.0	2.0
Handsom-Gum Powerline	B4	**Small bunched beaksedge** [c], coastal bog beaksedge, **ten-angled pipewort** [c], **dense-lowered camas** [c], **fringed meadow beauty** [c], **hairy St. John's-wort** [c], lance-leaved rose-gentian, northern pitcher plant, **red milkweed** [c], slender nutrush, **large spreading pogonia** [c], **southern bladderwort** [d], **tall yellow-eyed grass** [c], **pink sundew** [c, d], rose pogonia [d], **slender blue iris** [c, d], potential for Helicta satyr	7.8	4.7
Great Dismal Swamp: Northwest Section	B5	Canebrake rattlesnake, **hairy seedbox** [c], Swainson's warbler, Elliott's goldenrod, potential for eastern big-eared bat, southeastern myotis, fine-lined emerald, robust baskettail, Non-Riverine Wet Hardwood Forest (Embayed Region Type)	47.1	30.9
Great Dismal Swamp	B2	Large spreading pogonia, Elliott's goldenrod, **Walter's paspalum** [c], **fringed yellow-eyed grass** [c], **tall yellow-eyed grass** [c], hairy seedbox, Dismal Swamp southeastern shrew, potential for canebreak rattlesnake, eastern big-eared bat, southeastern myotis, fine-lined emerald, robust baskettail, Non-Riverine Wet Hardwood Forest (Embayed Region Type)	49.8	35.0
AP-1 Access Roads				
NFS Road Site (GWNF) [a]	*B3*	***Small whorled pogonia*** [c]***, American ginseng*** [c]***, potential southern water shrew habitat*** [c]	*1.6*	*1.6*
Windy Cove (GWNF)	*B2*	*Significant karst and karst fauna*	*9.5*	*9.5*
Big Cedar Shale Barren [e]	B2	Central Appalachian Shale Barren (southern type), Shale Barren Rock Cress, Millboro leatherflower	<0.1	<0.1

TABLE 4.4.2-1 (cont'd)

Virginia Conservation Sites Crossed by the Atlantic Coast Pipeline

Project Segment/Site Name	B-rank [b]	Natural Heritage Resource of Concern	Construction Impacts (acres)	Operational Impacts (acres)
Brown's Pond (GWNF) [f]	*B1*	***Fraser's marsh St. John's-wort*** *[c], Inflated sedge,* ***three birds orchid*** *[c], Central Appalachian Mountain Pond*	*2.2*	*2.2*
Burnsville Cove	B1	Eight globally rare cave adapted invertebrate species, 14 state designated significant caves, Indiana bat, Virginia big-eared bat, Northern long-eared bat, tricolored bat, little brown bat	1.8	1.8
Spruce Creek Tributary	B3	Central Appalachian Low-Elevation Acidic Seepage Swamp	1.1	1.1
Nottoway Basin	B2	Michaux's sumac, **Roanoke Logperch** [c], **Atlantic pigtoe** [c]	0.4	0.4
Upper Fontaine Creek	B5	Baldwin's spikerush; Bald Cypress – Water Tupelo Brownwater Swamp, Coastal Plain Bottomland Forest (Brownwater Low Terrace Type)	1.5	1.5
Woods Mill Bluff	B3	Piedmont/Coastal Plain Hemlock – Hardwood Forest	0.3	0.3
AP-3 Access Roads				
Great Dismal Swamp: Northwest Section	B2	Canebrake rattlesnake, **hairy seedbox** [c], Swainson's warbler, Elliott's goldenrod, potential for eastern big-eared bat, southeastern myotis, fine-lined emerald, robust baskettail, Non-Riverine Wet Hardwood Forest (Embayed Region Type)	1.3	0.5
Great Dismal Swamp	B5	Large spreading pogonia, Elliott's goldenrod, **Walter's paspalum** [c], **fringed yellow-eyed grass** [c], **tall yellow-eyed grass** [c], hairy seedbox, Dismal Swamp southeastern shrew, potential for canebreak rattlesnake, eastern big-eared bat, southeastern myotis, fine-lined emerald, robust baskettail, Non-Riverine Wet Hardwood Forest (Embayed Region Type)	4.4	2.7
		Total	306.0	160.7

[a] Final resources of concern are pending additional agency consultations.

[b] B-Rank Scale: B1 – Outstanding Significance; B2- Very High Significance; B3 – High Significance; B4 – Moderate Significance; B5 – Of General Biodiversity Significance.

[c] Bold indicates Atlantic observed these species and habitat types during 2015 and 2016 field surveys (through October 22, 2016). In correspondence between Atlantic and the VDCR, tall yellow-eyed grass was not listed as natural heritage resource of concern at the Handsom-Gum Powerline Conservation Site, Walter's paspalum and fringed yellow-eyed grass were not listed as natural heritage resources of concern at the Great Dismal Swamp NW Section Conservation Site, Walter's paspalum was not listed as a natural heritage resource of concern at the Great Dismal Swamp Conservation Site, and pine barren sandreed was not listed as a natural heritage resource of concern at the Emporia Powerline Bog Conservation Site.

[d] Pink sundew, slender blue iris, and rose pogonia are listed as a state rare "watchlist" species, which indicates the Virginia Natural Heritage is no longer tracking these resources due to the decrease in state and/or global rarity.

[e] The Big Cedar Shale Barren Conservation Site is crossed by workspace and an access road. Based on mapping provided by Atlantic, the crossing is not on NFS land, and would not impact the Big Cedar Shale Barren Special Biological Area.

[f] Brown's Pond construction and operation impacts are based on Atlantic's response to a FERC staff data request dated April 11, 2017.

Note: Due to rounding, some addends may be off by 0.1.

Italics indicate conservation sites located on NFS lands.

Source: VDCR, 2016a

TABLE 4.4.2-2

North Carolina Heritage Areas and Natural Communities Crossed by the Atlantic Coast Pipeline

Project Segment/Site Name	Rating Scale/ Rank [a, b]	Milepost	Construction Impacts (acres)	Operational Impacts (acres)
AP-2 Mainline				
Mush Island Natural Area	R4 / C5	9.9, 12.0	15.2	6.9
TAR/Rocky Swamp Aquatic Habitat Natural Area	NA / C4	32.0	0.1	<0.1
TAR/Fishing Creek Aquatic Habitat Natural Area	NA / C1	33.9	0.1	0.1
TAR/Swift Creek Aquatic Habitat Natural Area	NA / C1	40.6	0.1	0.1
TAR/Stony Creek Aquatic Habitat Natural Area	NA / C3	48.7	0.1	<0.1
TAR/Middle Tar River Aquatic Habitat Natural Area	NA / C2	59.4	0.1	0.1
NEU/Contentnea Creek Aquatic Habitat Natural Area	NA / C3	73.6	<0.1	<0.1
NEU/Little River Aquatic Habitat Natural Area	NA / C1	82.5	<0.1	<0.1
Cowbone Oxbows/Sage Pond Natural Area	R2 / C4	98.4	1.7	0.8
Brownwater Bottomland Hardwoods (High Subtype)	G3G4 / S2	98.4	0.7	0.5
Brownwater Levee Forest (Medium Levee Subtype)	G4 / S3S4	98.5	0.2	0.1
Oxbow Lake (Brownwater Subtype)	G3? / S1	98.5	<0.1	<0.1
Hannah Creek Swamp Natural Area	R5 / C5	101.2	1.6	1.0
Cypress-Gum Swamp (Blackwater Subtype)	G4? / S4	101.2	1.6	1.0
Cape Fear River Bluff Natural Area	R4/C5	129.9	15.3	6.8
Mesic Mixed Hardwood Forest (Coastal Plain Subtype)	G3 / S3	129.9	8.5	3.8
Brownwater Levee Forest (High Levee Subtype)	G3G5 / S3	130.0	6.8	3.0
Moss Neck Savanna Natural Area	R2 / C4	180.8	5.6	2.4
Mesic Pine Savanna (Lumbee Subtype)	G1 / S1	180.9	3.6	1.6
AP-3 Mainline				
Meherrin River Margarettsville Bottomlands Natural Area	R2 / C4	11.9	3.1	2.0
Brownwater Bottomland Hardwoods (High Subtype) [c]	G3G4 / S2	11.9	3.1	2.0
Brownwater Bottomland Hardwoods (Swamp Transition Subtype)	G3G4 /S3	11.9	3.1	2.0
Cypress-Gum Swamp (Brownwater Subtype)	G5/S4	11.9	3.1	2.0
AP-2 Access Roads				
Cowbone Oxbows/Sage Pond Natural Area	R2 / C4	98.4	0.7	0.0
Brownwater Bottomland Hardwoods (High Subtype)	G3G2 / S2		0.4	0.0
Oxbow Lake (Brownwater Subtype)	G3 /S1		0.1	0.0
AP-3 Access Roads				
Meherrin River Margarettsville Bottomlands Natural Area	R2 / C4	11.9	1.0	1.0
Brownwater Bottomland Hardwoods (High Subtype) [d]	G3G4 / S2		0.8	0.8
Brownwater Bottomland Hardwoods (Swamp Transition Subtype)	G3G4/S3		<0.8	<0.8
Total Natural Areas Crossed			32.6	16.4
Total Natural Communities Crossed			32.8	17.6

TABLE 4.4.2-2 (cont'd)				
North Carolina Natural Heritage Areas and Natural Communities Crossed by the Atlantic Coast Pipeline				
Project Segment/Site Name	Rating Scale/ Rank [a, b]	Milepost	Construction Impacts (acres)	Operational Impacts (acres)

[a] R-Rating Scale: R1 – Exceptional; R2 – Very High; R3 – High; R4 – Moderate; R5 – General.
C-Rating Scale: C1 – Exceptional; C2 – Very High; C3 – High; C4 – Moderate; C5 – General.

[b] Global and State Ranks for Natural Communities: G1 – Critically Imperiled; G2 – Imperiled; G3 – Vulnerable; G4 – Apparently Secure; G5 – Secure; and G? – Uncertain. S1 – Critically Imperiled; S2 – Imperiled; S3 – Vulnerable; S4 – Apparently Secure; S5 – Secure

[c] Also mapped as Brownwater Bottomland Hardwoods (Swamp Transition Subtype) and Cypress-Gum Swamp (Brownwater Subtype).

[d] Also mapped as Brownwater Bottomland Hardwoods (Swamp Transition Subtype).

Source: NCNHP, 2015

We received comments from the North Carolina Coastal Land Trust regarding impacts on the Meherrin River Margarettsville Bottomlands Natural Heritage Area. This Natural Heritage Area was designated to protect cypress-gum swamp, Coastal Plain levee forest, mesic mixed hardwood forest, and bottomland hardwood forest communities. The North Carolina Coastal Land Trust has indicated that the largest know population of Douglass' bittercress (*Cardamine douglassi*), a state-threatened species, occurs within the levee and bottomland hardwood forests within the Meherrin River Preserve and has the potential to occur on adjacent lands. If Douglass' bittercress is present within or adjacent to the construction workspace, construction activities would cause mortality of individuals, and may render habitat unsuitable for this species as it is largely absent in canopy gaps. Atlantic conducted botanical surveys in North Carolina per the protocols reviewed and approved by the FWS North Carolina Field Office and the NCDNCR; this species was not identified as a target species with the potential to occur in the ACP project area by the agencies, and no individuals were observed within the survey corridor. It is also important to note that Atlantic is required to obtain the necessary permits and authorizations required to construct and operate the project. As such, to the extent the state has regulatory authority and permitting jurisdiction for these features, Atlantic would consult with the NCDNCR. NCDNCR would have the opportunity to review Atlantic's proposed crossings during the permitting process and, if necessary, identify additional mitigation measures beyond those proposed.

Natural Communities

ACP would also cross nine natural communities in North Carolina, seven of which are located within five NHNAs. Natural communities are assigned a Global and State Rank. Global ranks indicate the relative imperilment of both species and ecological communities in a global context. For plant and animal species these ranks provide an estimate of extinction risk. State ranks indicate the relative imperilment of both species and ecological communities at the state level. For plant and animal species these ranks provide an estimate of risk of extirpation from the state (LeGrand et al., 2015). Construction of ACP would temporarily affect 32.8 acres and permanently affect 17.6 acres of natural communities (see table 4.4.2-2).

4.4.3 General Impacts and Mitigation on Vegetation Resources

Appendix Q provide a more detailed analysis of vegetation impacts by state, and describes the dominant vegetation, site characteristics, and amount of vegetation communities that would be impacted by the projects and assign each state's affected vegetation community type into a NLCD cover type (see table 4.4.1-1). The following sections provide a description of the impacts on each state's affected vegetation communities. The total acreage impacts by NLCD cover type and project facility are provided in table 4.4.3-1.

Construction of ACP and SHP would affect 7,508.9 acres of vegetation, including 3,130.6 acres of deciduous forest, 415.7 acres of coniferous forest, 2,590.3 acres of mixed forest, 385.1 acres of scrub-shrub, 225.9 acres of grassland/herbaceous, 4.4 acres of barren land, 699.8 acres of woody wetland, and 57.0 acres of herbaceous/palustrine emergent wetland (table 4.4.3-1). The primary effects of pipeline construction would be the cutting, clearing, and/or removal of existing vegetation within the work areas. The removal of trees along the right-of-way would expose trees growing adjacent to the newly created edge to higher wind velocities. Trees that are newly exposed to the edge and that are not physiologically adapted to edge conditions would become more vulnerable to windthrow at lower wind speeds than interior forest (Steil et al., 2009).

We received comments from the FS that overmature forests containing a high proportion of oak are at risk of oak decline. Oak decline occurs slowly, generally in trees that have been exposed to prolonged stress or advanced age. Removal of trees along the right-of-way may expose already stressed trees to edge effects that could further weaken the trees, making them more likely to be attacked by pests or diseases that would not invade healthy trees. Decline would then occur starting at the ends of branches and progressing downward and inward, including a reduction in radial growth, and eventually resulting in the death of the affected trees (Oak et al., 1986).

Areas where no permanent structures, aboveground facilities, or roads would occur are considered temporary impacts, because these areas would be restored and revegetated. However, the duration of these impacts could be either short-term or long-term, depending on pre-disturbance vegetation cover. For example, the clearing and restoration of forested areas would be a long-term to permanent impact because of the extended length of time it takes trees to grow to maturity from seedlings or saplings planted as part of the revegetation process. The permanent right-of-way in uplands would be maintained in an herbaceous vegetated state, and would be mowed no more than once every 3 years. However, a 10-foot-wide strip centered over the pipeline might be mowed annually as needed to facilitate corrosion and other operational surveys. Additionally, a 10-foot-wide corridor centered on the pipeline in wetlands and riparian areas would be maintained in an herbaceous state, which would be considered a permanent impact.

Vegetation impacts are considered short-term if, after three growing seasons, the revegetated disturbed areas resemble adjacent undisturbed lands in terms of density and cover of non-nuisance vegetation in non-agricultural areas, per the guidance identified in the FERC *Plan* (see table 2.3.1-1). Vegetated areas that have the potential for revegetation within three growing seasons include areas currently dominated by grass and shrubs. Approximately 225.9 acres of grassland/herbaceous, and 385.1 acres of scrub-shrub would experience short-term temporary impacts (see table 4.4.3-1).

Long-term impacts would last longer than three growing seasons within the disturbed area and in some cases, they would not resemble adjacent undisturbed lands for the life of the pipeline project (e.g., some long-term impacts would be permanent). For example, areas with trees and shrubs removed from coniferous, deciduous, and mixed forests would have long-term impacts. Particularly, mature trees would not regenerate during the life of the project, so their removal would be considered a permanent impact. The pipeline route would cross a total of 361.3 miles of late seral forests, and would remove 4,914.6 acres of large (mature) trees as shown in tables 4.8.1-5 and 4.8.1-6. Impacts on timber resources on federal lands are addressed in section 4.8.9. In addition, a portion of this initial construction impact would remain for the life of the ACP and SHP pipeline (i.e., would be a permanent impact), due to maintenance of the permanent right-of-way, access roads, and aboveground facilities. Permanent impacts would occur at all aboveground facilities, within the operational footprint. At those locations, vegetation would be removed during construction, but not revegetated. Instead, structures would be installed at the aboveground facilities locations, and their yards would be covered by gravel.

Additional long-term impacts would include the cutting of danger trees, which are defined as trees located outside approved construction areas that are at risk of falling on workers or vehicles and thus would need to be removed. The removal of these trees would result in an additional long-term impact to adjacent vegetation that cannot be quantified prior to construction.

Operational right-of-way maintenance, access roads, and aboveground facilities would affect non-forested/woodland habitats as well. Operation of ACP and SHP would affect 3,455.5 acres of vegetation, including 1,388.8 acres of deciduous forest, 199.5 acres of coniferous forest, 1,156.4 acres of mixed forest, 175.0 acres of scrub-shrub, 101.0 acres of grassland/herbaceous, 3.3 acres of barren land, 392.9 acres of woody wetland, and 38.6 acres of herbaceous/palustrine emergent wetland (see table 4.4.3-1).

We received comments on the draft EIS regarding the difficulty of restoring vegetation in steep slope areas. The steep slope areas are mostly located along the ACP route in the Appalachian region of West Virginia and western Virginia, but occasionally in other areas along the rights-of-way. Section 5.6 of Atlantic's and DETI's *Restoration and Rehabilitation Plan* (see appendix F) describes the methods that would be used to establish vegetation in steep slope areas. Fast-growing cool season grasses would be used to help ensure faster soil stabilization. Permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from surface of the rights-of-way, and encourage retention of soils may be used, in addition to additional structural material (e.g., rocky or woody debris) to provide an anchor for revegetation and deposition of soil. In addition to these measures, Atlantic and DETI would develop and implement other site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and restoring the rights-of-way in steep slope areas. Atlantic and DETI are also developing a BIC Team that would develop standard mitigation designs for steep slopes that are identified as potential hazards on the ACP and SHP (see section 4.1.4.2).

Impacts would be reduced by implementing the FERC *Plan* and *Procedures* (see table 2.3.1-1), Atlantic's and DETI's *COM Plan* (for activities on NFS lands, see appendix G), *Restoration and Rehabilitation Plan* (see appendix F), *HDD Plan* (see appendix H), *SPCC Plan*, *Timber Removal Plan*, *Invasive Plant Species Management Plan*, *Fire Plan*, and the *Fugitive Dust Control and Mitigation Plan* (see table 2.3.1-1). Atlantic and DETI would also implement the WVDEP's *Erosion and Sediment Control Best Management Practice Manual* (WVDEP, 2006a), the Virginia *Erosion and Sediment Control Handbook* (VDEQ, 1992), the Pennsylvania *Erosion and Sediment Pollution Control Program Manual* (PDEP, 2012), and the North Carolina *Erosion and Sediment Control Planning and Design Manual* (North Carolina Sedimentation Control Commission et al., 2013). Revegetation measures would be implemented in accordance with the construction and restoration plans and as required by landowners and land managing agencies. Disturbed, non-cultivated work areas would be stabilized and seeded as soon as possible after final grading, weather and soil conditions permitting, subject to the recommended seeding dates for the seed mixes used to revegetate different areas along the pipeline system. Seeding would stabilize the soil, improve the appearance of the area disturbed by construction, and in some cases, restore native flora.

Atlantic's *Restoration and Rehabilitation Plan* (see appendix F), outlines the seed mixes and restoration practices that would be used along the pipeline route, and includes a section on pollinator habitat planting and maintenance. Some seed mixes would incorporate regionally specific and native forb (flowering plant) mixes in the traditionally all-grass seed mixes to provide food and habitat for pollinators and local wildlife species. Atlantic continues to coordinate with the appropriate agencies to identify seed mixes and practices. Atlantic would include final seed mixes in the *Restoration and Rehabilitation Plan* prior to construction.

TABLE 4.4.3-1

National Land Cover Database Cover Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project

Project/State/Component	Deciduous Forest Con.[a]	Deciduous Forest Op.[b]	Coniferous Forest Con.	Coniferous Forest Op.	Mixed Forest Con.	Mixed Forest Op.	Scrub-Shrub Con.	Scrub-Shrub Op.	Grassland / Herbaceous Con.	Grassland / Herbaceous Op.	Barren Land Con.	Barren Land Op.	Woody Wetlands Con.	Woody Wetlands Op.	Emergent Wetlands[d] Con.	Emergent Wetlands[d] Op.	Total Con.	Total Op.
ATLANTIC COAST PIPELINE																		
West Virginia																		
Pipeline Right-of-Way	744.0	298.4	5.9	2.5	433.5	169.6	2.4	1.1	0.0	0.0	0.5	0.2	20.8	8.4	0.0	0.0	1207.0	480.2
ATWS [c]	55.4	0.0	0.2	0.0	22.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	82.8	0.0
Aboveground Facilities [d]	21.3	14.6	0.0	0.0	23.4	11.4	0.3	0.3	0.0	0.0	0.0	0.0	5.6	2.8	0.0	0.0	50.6	29.1
Cathodic Protection	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	<0.1	<0.1
Access Roads	173.5	171.5	0.1	0.1	89.0	87.3	1.2	1.2	0.0	0.0	1.6	1.6	18.6	18.5	0.0	0.0	284.0	280.2
Pipe/Contractor Yards	11.3	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.3	0.0	0.0	0.0	41.6	0.0
West Virginia Subtotal	**1,005.5**	**484.5**	**6.2**	**2.6**	**574.3**	**268.3**	**4.2**	**2.6**	**0.0**	**0.0**	**2.1**	**1.8**	**73.8**	**29.7**	**0.0**	**0.0**	**1666.1**	**789.5**
Virginia																		
Pipeline Right-of-Way	1249.7	534.9	13.1	4.6	1237.1	501.7	209.4	95.5	53.3	20.1	1.4	0.6	230.9	140.9	51.4	35.5	3046.3	1333.8
ATWS [c]	148.8	0.0	0.0	0.0	72.0	0.0	20.0	0.0	0.4	0.0	<0.1	0.0	10.9	0.0	0.7	0.0	252.8	0.0
Aboveground Facilities [d]	21.9	6.7	0.0	0.0	30.2	9.5	1.0	1.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	53.4	17.5
Cathodic Protection	0.5	0.2	0.0	0.0	0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	0.0	0.0	0.8	0.3
Access Roads	116.5	111.0	1.0	1.0	95.9	92.2	14.5	11.7	3.8	3.8	0.9	0.9	10.9	5.6	1.7	1.2	245.2	227.4
Pipe/Contractor Yards	40.6	0.0	0.0	0.0	2.4	0.0	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	61.5	0.0
Virginia Subtotal	**1578.0**	**652.8**	**14.1**	**5.6**	**1437.8**	**603.4**	**263.3**	**108.2**	**57.5**	**23.9**	**2.3**	**1.5**	**253.1**	**146.8**	**53.9**	**36.7**	**3660.1**	**1579.0**
North Carolina																		
Pipeline Right-of-Way	348.9	175.3	361.4	182.6	106.9	52.6	68.8	37.8	141.6	63.9	0.0	0.0	335.5	202.3	3.0	1.9	1366.1	716.4
ATWS [c]	24.8	0.0	19.1	0.0	7.3	0.0	4.0	0.0	7.3	0.0	0.0	0.0	11.5	0.0	0.1	0.0	74.1	0.0
Aboveground Facilities [d]	3.1	2.8	2.7	2.7	1.7	1.7	33.5	20.6	2.8	2.8	0.0	0.0	0.0	0.0	0.0	0.0	43.8	30.6
Cathodic Protection	0.4	0.2	0.5	0.2	<0.1	<0.1	<0.1	<0.1	0.9	0.4	0.0	0.0	0.2	0.1	0.0	0.0	2.0	0.9
Access Roads	11.2	10.5	8.5	5.8	4.2	3.4	4.9	2.7	10.5	10.0	0.0	0.0	11.5	5.9	0.0	0.0	50.8	38.3
Pipe/Contractor Yards	2.2	0.0	3.2	0.0	0.2	0.0	0.3	0.0	5.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	11.6	0.0
North Carolina Subtotal	**390.6**	**188.8**	**395.4**	**191.3**	**120.3**	**57.7**	**111.5**	**61.1**	**168.4**	**77.1**	**0.0**	**0.0**	**359.1**	**208.3**	**3.1**	**1.9**	**1548.4**	**786.2**
Atlantic Coast Pipeline Total	**2974.1**	**1326.1**	**415.7**	**199.5**	**2132.4**	**929.4**	**379.0**	**171.9**	**225.9**	**101.0**	**4.4**	**3.3**	**686.1**	**384.8**	**57.0**	**38.6**	**6874.6**	**3154.7**
SUPPLY HEADER PROJECT																		
Pennsylvania																		
Pipeline Right-of-Way	4.5	2.0	0.0	0.0	18.4	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9	11.0
ATWS [c]	0.3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0

TABLE 4.4.3-1 (cont'd)

NLCD Cover Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project

	Deciduous Forest		Coniferous Forest		Mixed Forest		Scrub-Shrub		Grassland / Herbaceous		Barren Land		Woody Wetlands		Emergent Wetlands [d]		Total	
Project/State/Component	Con.[a]	Op.[b]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Aboveground Facilities [d]	1.3	0.0	0.0	0.0	1.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.9
Cathodic Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Access Roads	1.8	1.8	0.0	0.0	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	4.4
Pipe/Contractor Yards	2.6	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
Pennsylvania Subtotal	**10.5**	**3.8**	**0.0**	**0.0**	**24.7**	**12.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**35.2**	**16.3**
West Virginia																		
Pipeline Right-of-Way	67.0	33.5	0.0	0.0	295.0	147.0	2.5	1.5	0.0	0.0	0.0	0.0	7.0	3.5	0.0	0.0	371.5	185.5
ATWS [c]	12.8	0.0	0.0	0.0	47.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	62.2	0.0
Aboveground Facilities	28.6	6.2	0.0	0.0	21.5	2.1	1.1	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	51.5	8.6
Cathodic Protection	0.2	0.2	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	1.1	1.1
Access Roads	18.9	18.9	0.0	0.0	64.8	64.8	1.3	1.3	0.0	0.0	0.0	0.0	4.3	4.3	0.0	0.0	89.3	89.3
Pipe/Contractor Yards	18.5	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	23.6	0.0
West Virginia Subtotal	**146.0**	**58.8**	**0.0**	**0.0**	**433.2**	**214.5**	**6.1**	**3.1**	**0.0**	**0.0**	**0.0**	**0.0**	**13.7**	**8.0**	**0.0**	**0.0**	**599.1**	**284.5**
Supply Header Project Total	**156.5**	**62.6**	**0.0**	**0.0**	**457.9**	**227.0**	**6.1**	**3.1**	**0.0**	**0.0**	**0.0**	**0.0**	**13.7**	**8.0**	**0.0**	**0.0**	**634.3**	**300.8**
ACP and SHP Total	**3130.6**	**1388.8**	**415.7**	**199.5**	**2590.3**	**1156.4**	**385.1**	**175.0**	**225.9**	**101.0**	**4.4**	**3.3**	**699.8**	**392.9**	**57.0**	**38.6**	**7508.9**	**3455.5**

[a] Project-specific construction right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on typical construction right-of-way widths (125, 110, 75 feet, etc.) for the entire length of the pipelines discussed in section 2.2.1. The construction right-of-way width would be reduced at certain locations (e.g., wetlands). Some portions of the right-of-way would overlap with existing rights-of-way that have been previously disturbed, and/or the HDD method would be used to avoid direct impacts on vegetation. Impacts from valves are included in the pipeline right-of-way and would temporarily impact 1.0 acre of forested land, 0.2 acre of tree plantation, and 0.8 acre of open land. Impacts from communication towers on agricultural and developed land are provided in section 4.8.1.2 and table 4.8.1-1. Newly added topsoil workspace is included in the pipeline rights-of-way.

[b] Project-specific operational right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on a typical operational right-of-way width of 75 to 50 feet for the entire length of the pipelines discussed in section 2.2.1. Most vegetation types would be allowed to revert to preconstruction conditions, limited vegetation maintenance would be allowed in wetlands, some portions of the right-of-way would overlap with existing rights-of-way that are maintained, and/or the HDD method would be used to avoid direct impacts on vegetation. Impacts from valves are included in the pipeline right-of-way and would permanently impact 1.0 acre of forested land, 0.2 acre of tree plantation, and 0.8 acre of open land.

[c] Includes water impoundment structures that would be erected within ATWS areas.

[d] Aboveground facilities include compressor stations, M&R stations, and pig launcher/receivers.

[e] Emergent wetland includes herbaceous and palustrine emergent wetlands.

Note: Due to rounding, totals may be off by up to 0.1 place.

4.4.4 Noxious Weeds and Other Invasive Plants

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that can exclude and outcompete desirable native species, thereby decreasing overall species diversity. The term "noxious weed" is legally defined under both federal and state laws. Under the Federal Plant Protection Act of 2000, a noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and manage its lands accordingly. A species is considered invasive if it is non-native to the ecosystem under consideration, and its introduction causes or is likely to cause economic or environmental harm or harm to human health (EO 13112).

The removal of existing vegetation and disturbance of soils during construction of the proposed facilities could create conditions conducive to the establishment of noxious weeds and invasive plants, particularly where new corridors are established in previously forested areas. Based on state/commonwealth noxious weed and invasive species lists, agency consultations, and field surveys completed in through June 2016, Atlantic and DETI documented state-listed noxious weeds and invasive plant species within a 300-foot-wide corridor along portions of the proposed ACP and SHP pipeline routes. The following species were observed along the ACP survey corridor: tree of heaven, musk thistle, autumn olive, Morrow's honeysuckle, Japanese stiltgrass, Japanese knotweed, multiflora rose, Johnsongrass, and wavyleaf basketgrass. Invasive plant species observed along the SHP survey corridor include: tree of heaven, curled thistle, autumn olive, Morrow's honeysuckle, Tartarian honeysuckle, Japanese stiltgrass, Japanese knotweed, and multiflora rose.

We received numerous comments on the draft EIS regarding the list of invasive plant species utilized by Atlantic and DETI. In letters dated February 7, 2017, and February 24, 2017, the VDGIF requested an expanded list of invasive and noxious species to include invasive plants recognized by regional (Mid-Atlantic Invasive Plant Council) or state (Virginia Invasive Species Workgroup/VDCR-DNH) authorities. In addition, the VDCR-DNH suggested use of the Virginia Invasive Plant Species List, which includes species that are established or may become established in Virginia, cause economic and ecological harm, and present ongoing management issues. While state and regional authorities maintain extensive invasive species lists, not all species on these lists are regulated under state or federal regulations. Atlantic and DETI consulted with state agencies charged with regulating noxious weeds and invasive plant species to identify a total of 55 regulated invasive plant species, including 17 in West Virginia, 9 in Virginia, 16 in North Carolina, and 13 in Pennsylvania. Field surveys along ACP identified eight invasive species in West Virginia and one in North Carolina. Field surveys along SHP identified eight invasive species in West Virginia and one in Pennsylvania. The *Invasive Species Management Plan* (see table 2.3.1-1) lists the regulated noxious weeds and invasive plant species identified during field surveys. Sections 4.5.7 and 4.6.4 discuss invasive insect and aquatic species, respectively.

During field surveys, Atlantic and DETI also identified invasive species that are adjacent to threatened and endangered plant species along the proposed route. The *Invasive Species Management Plan* (see table 2.3.1-1) lists the invasive plant species adjacent to threatened, endangered, and rare plant species along the ACP pipeline route. These locations are not disclosed in this document to protect the sensitive species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency request to restrict the release of the location information. While methods used to remove invasive species and noxious weeds vary depending on the species involved, in general, agency recommendations include spot treatment with herbicides and hand pulling within a 10-foot buffer around sensitive plants. Spraying for invasive plants would not occur within 25 feet of known ESA-listed plant populations.

We received comments on the draft EIS expressing concern over aerial spraying of herbicides along the right-of-way. Aerial spraying would not be used for invasive species control along the right-of-way; only hand application methods such as backpack spraying and hand pulling would occur. No spraying or mixing would be allowed within 100 feet of any wetland or waterbody, or within 300 feet of any identified karst feature, except where allowed by state or federal agencies. In addition, herbicides would not be utilized for normal vegetation maintenance. Additional information on herbicide application methods is included in Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F), *COM Plan* (appendix G), and *Invasive Species Management Plan* (see table 2.3.1-1). While the Draft Biological Assessment dated January 27, 2017, states the following, the *Restoration and Rehabilitation Plan* (appendix F), *COM Plan* (appendix G), and *Invasive Species Management Plan* (see table 2.3.1-1) do not:

- aerial spraying would not be utilized for invasive species control along the right-of-way;
- no herbicides would be applied within 25 feet of ESA-listed plant species;
- no use of herbicides or pesticides within 100 feet of a waterbody or wetland, except where allowed by state or federal agencies; and
- no spraying of insecticides or herbicides would be allowed within the 300-foot karst feature buffer, except where allowed by state or federal agencies.

Therefore, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary and appropriate federal and state agencies an updated *Restoration and Rehabilitation Plan* and *Invasive Species Management Plan,* for review and written approval by the Director of OEP, that includes the following measures:**

  a. aerial spraying would not be utilized for invasive species control along the right-of-way;

  b. no herbicides would be applied within 25 feet of ESA-listed plant species;

  c. no use of herbicides or pesticides within 100 feet of a waterbody or wetland, except where allowed by state or federal agencies;

  d. no spraying of insecticides or herbicides would be allowed within the 300-foot karst feature buffer, except where allowed by state or federal agencies; and

  e. includes the results of the West Virginia and Virginia Natural Heritage Program recommendations for herbicide treatment adjacent to sensitive features.

The FS is reviewing the *COM Plan* (see appendix G) and will coordinate with Atlantic on the final plan (see section 4.4.8).

Construction of ACP and SHP projects has the potential to increase the risk of invasive plant species within and adjacent to the project area due to the amount of ground disturbance, heavy equipment use, and potential off-site vectors (i.e., equipment used in other locations). The VDCR-DNH has identified wavyleaf basketgrass as an invasive species of special concern, as it may exist in the vicinity of the BRP and adjacent to the GWNF and is considered highly invasive due to the abundance of small, sticky seeds which are readily carried by clothes, shoes, vehicles, and equipment. Atlantic and DETI would avoid introducing or spreading invasive species through adherence to federal and state-specific regulations for preventing the land transport of such species, and would follow measures outlined within their *Invasive Plant Species Management Plan* (see table 2.3.1-1). These measures are designed to prevent the introduction and spread of invasive plants during construction and operation through identification, pre-treatment control (application of herbicide, hand pulling, or mechanical measures such as mowing), cleaning equipment (including timber mats) prior to arrival at the construction site, segregating topsoil in all infested areas, using certified weed-free erosion control materials, routine monitoring, and restoration and reseeding following installation of the pipeline, which would promote the establishment of desirable plant species and deter the spread of invasive plant species.

Atlantic and DETI would also actively discourage use of off-highway vehicles (OHV) on their pipeline rights-of-way to avoid issues related to illegal access, erosion, spread of invasive plant species, and disturbance to restored areas. Measures that may be used to discourage OHV use may include installing barriers such as signs, fences, gates, vegetation, or boulders along the right-of-way. Atlantic and DETI would also coordinate with the appropriate land-managing agencies to identify and prioritize where installation of OHV deterrents would be beneficial.

4.4.5 Fire Regimes

A fire regime is the pattern of seasonality, frequency, and intensity of fire that prevails in an area. While fires may have been frequent on the landscape, they vary greatly in their intensity and effects within and between vegetation types. Fire plays an important role in maintaining the composition, structure, and distribution of vegetative communities. Fire regimes characterize the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread and effects, and spatial context. The projects would cross diverse landscapes with multiple fire regimes as shown in table 4.4.5-1. Most of the project area is intermixed between Fire Regime Groups I, III, and V. ACP would cross scattered areas of Fire Regime Groups I, III, and V in West Virginia, all fire regimes in Virginia and North Carolina. SHP would cross areas containing scattered Fire Regime Groups I and III in Pennsylvania, and Groups I, III, and V in West Virginia.

TABLE 4.4.5-1

Fire Regime Groups Crossed by the Atlantic Coast Pipeline and Supply Header Project

State	Fire Regime Group	Frequency	Severity
PENNSYLVANIA	Group I	0 – 35 years	Low and Mixed
	Group III	35 – 200 years	Low and Mixed
WEST VIRGINIA	Group I	0 – 35 years	Low and Mixed
	Group III	35 – 200 years	Low and Mixed
	Group V	> 200 years	Any
VIRGINIA	Group I	0 – 35 years	Low and Mixed
	Group II	0 – 35 years	Replacement
	Group III	35 – 200 years	Low and Mixed
	Group IV	35 – 200 years	Replacement
	Group V	> 200 years	Any
NORTH CAROLINA	Group I	0 – 35 years	Low and Mixed
	Group II	0 – 35 years	Replacement
	Group III	35 – 200 years	Low and Mixed
	Group IV	35 – 200 years	Replacement
	Group V	> 200 years	Any

Source: USGS, 2013b.
Note: ACP would cross areas of Fire Regime Groups I, III, and V on the MNF and GWNF.

Construction of the projects could increase the risk of fires. However, the exact risk of fires would be dependent on local conditions and construction activities. The risk for fires would be greatest in the areas crossed by the project that experience hot, dry conditions, and lowest in the areas that experience cool, wet climates. The pipeline route crosses a wide range of vegetation types, elevations, and climates. For example, on the GWNF, the drier ridgetops and south to west facing slopes typically dominated by pine and some dry-site oaks had the most frequent and intense fires while the cove and riparian areas with species such as yellow poplar and hemlock had less frequent and very low intensity fires. Typically fires on the upper drier slopes would be naturally extinguished as they burned into the cool moist habitats in coves and along streams.

Atlantic and DETI have prepared a *Fire Plan* and an *Open Burning Plan* (see table 2.3.1-1) to address fire prevention, suppression, and personnel training. The plans identify BMPs and protocols for preventing fires and responding to fires that occur during construction, including prescribed burns used to reduce vegetative debris and unplanned fires such as lightning strikes, smoking, and equipment malfunction. The *Fire Plan* is consistent with applicable Federal and state/commonwealth laws, regulations, plans, and policies, including Chapter 14 of the 2003 International Fire Code (Combustible Dust-Producing Operations) and Section A104 of the International Wildland-Urban Interface Code (Ignition Source Control). Atlantic also developed an *Open Burning Plan* that outlines procedures for burning vegetation along the right-of-way. We have reviewed Atlantic's and DETI's *Fire Plan* and *Open Burning Plan*, and find them acceptable on all lands except for NFS lands.

4.4.6 Vegetation Resources on Federal Land

ACP would cross 20.2 miles of NFS lands on the MNF and the GWNF, and 0.1 mile of the BRP. The BRP would be crossed via the HDD method and would not impact vegetation resources (see section 4.8.9). This section discusses vegetation resources that occur within the NFS lands. Section 4.7.3 and appendix R discuss special status species that have been documented on the MNF and GWNF.

4.4.6.1 Monongahela National Forest

The MNF has 40 distinct forest cover types that are combined into seven general types that have similar species and responses to silvicultural treatments. Table 4.4.6-1 provides a summary of the vegetation communities crossed by ACP.

As discussed in section 4.4.1, ACP would cross an area of mixed northern hardwood-red spruce forest on the MNF in West Virginia. In general, red spruce grows in association with hemlock, red and sugar maple, yellow birch, pin cherry, beech, and black cherry, but may grow in almost pure stands. The stand that would be impacted is largely dominated by hardwoods, with scattered red spruce and hemlock. On the MNF, Atlantic would construct two new access roads across a small segment of Management Prescription 4.1 (Spruce and Spruce-Hardwood Ecosystem Management) between AP-1 MPs 71.6 and 72.0 near Gibson Knob. Management emphasis in this prescription area is placed on restoration and management of disjunct red spruce and spruce hardwood communities. The section of this management prescription area to be crossed was surveyed in 2016 and categorized as hemlock forest and existing FS roads. ACP would affect 0.9 acre of hemlock forest within the construction right-of-way and ATWS, and 3.8 acres of FS Roads for a long-term access road.

TABLE 4.4.6-1

Vegetation Communities Affected by Construction and Operation of the Atlantic Coast Pipeline on the Monongahela National Forest

MNF Forest Cover Type/ Vegetation Community Type [a]	Construction [b] (acres)	Operation [c] (acres)
Oak-Pine / Oak-Hickory		
Dry-Mesic Oak Forests	13.8	7.1
Dry Oak (-Pine) Forests	49.2	19.4
Montane Red Oak Forests	10.5	3.6
Pine-Oak Rocky Woodlands	1.3	0.7
Northern Hardwoods		
Mixed Mesophytic Forests	3.1	1.7
Northern Hardwood Forests	25.0	15.5
Eastern Spruce-Fir		
Red Spruce Forests	0.2	0.1
Small Stream Riparian Habitats	0.1	0.1
TOTAL	**103.2**	**48.2**

[a] MNF Forest Cover Types (FS, 2011). State Vegetation Community Type data for West Virginia (WVDNR, 2015b).

[b] Construction impacts include ATWS, construction yards, and temporary construction right-of-way. No temporary access roads are proposed on the MNF. Impacts from improvements to existing forest roads are not included. Atlantic continues to coordinate with the FS on the extent and type of improvements to be made on existing FS roads. ATWS for topsoil is included.

[c] Operational impacts are based on a 50-foot-wide permanent right-of-way for AP-1. Field surveys would be done in 2017 to determine the vegetation community type that would be impacted by one new long-term access road.

Note: Due to rounding, totals may be off by up to 0.1 place.

We recommended in the draft EIS that because consultations regarding the crossing of NFS lands on the MNF are ongoing, and specific measures to promote compatibility with its management and initiatives have not yet been identified, Atlantic should identify any specific construction, restoration, and/or operation mitigation measures identified by the MNF that would be implemented to promote compatibility with the restoration and management of disjunct red spruce and spruce-hardwood communities. In response to our recommendation, Atlantic met with MNF staff to review areas of red spruce near AP-1 MPs 71.6 and 72.0 near Gibson Knob. Mature red spruce, and regenerating red spruce and hemlock were found scattered throughout the area. This area is considered part of the regenerating northern hardwood and spruce community type and is considered key habitat for the West Virginia northern flying squirrel. Based on the consultations with MNF staff, Atlantic would implement the following measures to minimize impacts to this area; Atlantic would continue to coordinate with the MNF to finalize these measures:

- Limited widening of access road 05-001-C009.AR1 (FR 1026) on Gibson Knob.
- Realign a segment of a proposed new access road to minimize clearing of regenerating red spruce and hemlock forest.
- Transplant red spruce and hemlock saplings from the newly constructed access road corridor to unaffected areas.
- Retain existing mature spruce and hemlock trees by side trimming the trees, instead of removing them, including those along the clearing north of MP 71.7.
- Survey the MNF boundary between MPs 71.6 and 71.7.

- Replant additional temporary workspaces and the outermost portions of the construction right-of-way with a combination of native tree and shrub seedlings as described in Atlantic's *COM Plan* and in consultation with the MNF.

4.4.6.2 George Washington National Forest

Table 4.4.6-2 provides a summary of the vegetation communities crossed by ACP.

TABLE 4.4.6-2

Vegetation Communities Affected by Construction and Operation of the Atlantic Coast Pipeline on the George Washington National Forest

GWNF Ecological System Group/ Vegetation Community Type [a]	Construction [b] (acres)	Operation [c] (acres)
Cliff, Talus and Shale Barrens		
Acidic Cliff and Talus	0.5	0.4
Northern Hardwood Forests		
Appalachian (Hemlock)-Northern Hardwood Forest	3.5	1.9
Oak Forests and Woodlands		
Central and Southern Appalachian Montane Oak Forest	32.6	18.1
Dry Oak-Pine Forest, Central Apps and Southern Piedmont	118.2	54.2
Northeastern Interior Dry-Mesic Oak Forest	101.5	44.0
Alkaline and Mafic Glades and Barrens		
Central Appalachian Alkaline Glade and Woodland	9.6	4.8
Pine Forests and Woodlands		
Central Appalachian Pine-Oak Rocky Woodland	6.7	3.4
Southern Appalachian Montane Pine Forest and Woodland	2.5	0.7
Cove Forests		
Southern and Central Appalachian Cove Forest	9.9	4.3
TOTAL	**285.0**	**131.8**

a GWNF Ecological System Group (FS, 2014.). State Vegetation Community Type for Virginia (Nature Conservancy, 2015). The ACP crosses <0.1 acre of Montane Red Forest in West Virginia. State Vegetation Community Type for West Virginia (WVDNR, 2015b).

b Construction impacts include ATWS for topsoil.

c Operational impacts are based on a 50-foot-wide right-of-way.

Note: Due to rounding, totals may be off by up to 0.1 place.

Atlantic conducted surveys across the MNF between June and September 2016, and about 80 percent of the ACP project area on the GWNF was surveyed between April and August 2016. The remaining areas to be surveyed on the GWNF in 2017 include approximately 1.3 miles between MP 96.0 and 97.5.

4.4.7 Vegetation Communities of Special Concern or Management on Federal Lands

Atlantic consulted with the FS to identify unique, sensitive, and protected vegetation communities, and natural areas that could be affected by ACP on NFS lands. Potential impacts on wildlife and wildlife habitat within State Forests and Wildlife Management Areas are discussed in section 4.5.2. Section 4.7.3 and appendix R provide sensitive plant species information (e.g., Regional Foresters' Sensitive Species [RFSS], and GWNF locally rare species).

As listed in table 4.4.2-1, ACP would cross three vegetation communities of special concern on the GWNF: NFS Road, Windy Cove, and Brown's Pond Special Biological Area (SBA).

The NFS Road site is considered a site of High Significance (B3). During field surveys, Atlantic identified small whorled pogonia, American ginseng, and potential southern water shrew habitat. Construction would affect 6.7 acres of vegetation, including 5.1 acres for the pipeline and 1.6 acres for the access road. Operations would affect 3.5 acres of vegetation, including 1.9 acres for the pipeline and 1.6 acres for the access road.

Windy Cove is considered a site of Very High Significance (B2) for significant karst and karst fauna. Construction would affect 104.6 acres of vegetation, including 95.1 acres for the pipeline and 9.5 acres for the access road. Operations would affect 43.7 acres of vegetation, including 34.2 acres for the pipeline and 9.5 acres for the access road.

Brown's Pond SBA is considered a site of Outstanding Significance (B1) for Fraser's marsh St. John's-wort, inflated sedge, three birds orchid, and Central Appalachian Mountain Pond, a seasonally flooded sinkhole pond community dominated by three-way sedge (*Dulichium arundinaceum*) and buttonbush (*Cephalanthus occidentalis*). This sinkhole pond provides important breeding habitat for amphibians, dragonflies, and damselflies. This community type is known from less than 20 sites in the U.S. and is threatened by hydrologic disturbance and timber harvests (NatureServe, 2015). Atlantic observed Fraser's marsh St. John's-wort, and three birds orchid, which are GWNF locally rare species, during 2015 and 2016 field surveys. Construction would affect 2.2 acres of vegetation for construction related to access road 36-016.AR1 (FR 281/Tower Mtn. Road), and operations would affect 2.2 acres of vegetation. The populations of Fraser's marsh St. John's-wort and three birds orchid are located approximately 1,000 feet downslope of access road 36-016.AR1 (refer to table R-4 of appendix R).

According to table 2.1.1-1 and section 2.1.1.4 of the updated *COM Plan*, the Brown's Pond SBA access road would be widened and gravel added to the entrance where the road intersects Indian Draft Road. According to table 2.1-2 of the Draft BE, the road would be regraded and gravel added in select locations. In response to Staff Recommendation 76a of the draft EIS, Atlantic stated that it would widen the entrance where FR 281 intersects Indian Draft Road and apply gravel to the road surface. In a letter dated April 28, 2017, the FS requested additional information in order to make a final determination on impacts from the ACP. To date, Atlantic has not provided the additional information to the FS. In addition, we note a discrepancy in the acreages of construction and operation impacts from the access road for Brown's Pond SBA in table E-1 Access Roads for the ACP and SHP, and table 4.4.2-1 filed on May 8, 2017. Atlantic contends that it is not proposing construction or reconstruction of FR 281. However, the FS has expressed concern that the existing access road may not be able to accommodate the equipment. Due to the need for clarification on the extent of improvements and associated impacts related to access road 36-016.AR1, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, and the FS for review and concurrence, detailed mapping of the existing conditions and proposed improvements to access road 36-016.AR1, including digital data, a description of the construction and operation impacts, including impacts on the adjacent vegetation communities, potential pond crossings identified in appendix K of the EIS, GWNF locally rare species located downslope, and identify the conservation measures that would be implemented to mitigate potential impacts.**

We received comments regarding potential impacts of ACP crossing five designated SBAs on the GWNF, including Browns Pond, Ratcliff Hill, Big Cedar Shale Barren, Reubens Draft Shale Barren, and Big Levels Macrosite. The Ratcliff Hill SBA, Reubens Draft Shale Barren SBA, and Big Levels Macrosite SBA would not be crossed by ACP. Based on mapping provided by Atlantic, the Big Cedar Shale Barren

SBA on the GWNF, would not be crossed. A portion of the Big Cedar Shale Barren Conservation Site, outside of the GWNF, would be crossed by workspace and an access road (see table 4.4.2-1).

The FS identified karst areas (caves and sinkholes) that would be impacted in Poplar Hollow near AP-1 MP 97.0 and on Brushy Ridge near AP-1 MP 106.0. Karst areas on federal lands are discussed in section 4.1.6, and section 4.5.2.4 discusses impacts on karst, cave, and subterranean wildlife habitat.

4.4.8 General Impacts and Mitigation on Federal Lands

General impacts and mitigation for vegetation resources on federal lands are similar to those described under section 4.4.3. Section 4.8.9 also describes federal land designations and the effects the pipeline would have on these lands, including impacts on the BRP and timber resources.

Atlantic proposes to utilize a 125-foot-wide construction right-of-way in upland vegetation, and a 75-foot-wide construction right-of-way in wetlands on federal lands. Additional areas that extend beyond the construction right-of-way would also be utilized for additional spoil storage, log landings, or equipment staging. As a result, construction of ACP on federal lands would impact a total of 388.2 acres of vegetation, including 103.2 acres on the MNF and 285.0 acres on the GWNF. Operation of ACP would permanently affect a total of 180.0 acres of vegetation on federal land, including 48.2 acres on the MNF, and 131.8 acres on the GWNF. Following construction, lands outside of the permanent right-of-way and the ATWS, staging areas, pipe/contractor yards, and temporary access roads would be actively restored according to revegetation guidance documents prepared by the FS and filed with the FERC. Pipeline operation would preclude construction of aboveground structures within the proposed 50-foot-wide permanent right-of-way in upland vegetation on federal lands. If approved, Atlantic would acquire a 50-foot-wide long-term right-of-way on federal lands. To minimize forest fragmentation and impacts on scenery, the FS would require that operational and maintenance provisions outlined within the FERC *Procedures* in wetlands also be applied to upland areas along the area of the right-of-way so that the permanently maintained right-of-way would be no greater than 30-feet-wide. Atlantic would reduce its mowing to a 10-foot-wide strip centered over the pipeline, and reduce the trimming or selective cutting of trees to a 30-foot-wide strip centered over the pipeline. Consistent with the terms and conditions of the Right-of-Way Grant, Atlantic would be allowed utilize the full permanent right-of-way if needed for emergency or other repairs to the pipeline.

Short-term impacts on federal lands would occur in areas currently dominated by grass and shrubs. Approximately 9.6 acres of grassland/herbaceous (Alkaline and Mafic Glades and Barrens) would experience short-term temporary impacts (see appendix Q and table 4.4.6-2).

Long-term impacts on federal lands would last longer than three growing seasons within the disturbed area and in some cases, they would not resemble adjacent undisturbed lands for the life of the pipeline project (e.g., some long-term impacts would be permanent). For example, long-term impacts would occur in areas with trees and shrubs removed from coniferous, deciduous, and mixed forests. Particularly, mature trees within the permanent right-of-way would not regenerate during the life of the project, so their removal would be a long-term to permanent loss. On NFS lands, the pipeline route would remove 309.3 acres of large (mature) trees during construction, as shown in table 4.8.9-5. Due to the lack of advanced oak regeneration and relatively large size and advanced age of the existing trees, areas occupied predominantly by oak species are not expected to regenerate to their present community type. The percentage of oak in these areas is expected to be reduced due to a lack of regeneration potential resulting in a reduction of hard mast production (hard nuts and seeds such as acorns, hickory nuts, and walnuts). On drier sites pine species, black gum, and perhaps red maple would be expected to outcompete oak. On more mesic sites, a variety of other hardwood species including red maple and yellow poplar would likely outcompete oak. On areas outside of the permanent right-of-way and the ATWS, staging areas, pipe/contractor yards, and temporary access roads, non-native invasive plant species such as those identified in section 4.4.9 would likely increase.

Atlantic prepared a *COM Plan* (see appendix G), which outlines the specific construction, operation, and maintenance plans that would be utilized on the MNF and GWNF. The following sections or plans of the *COM Plan* contain avoidance and minimization measures that would apply vegetation resources conservation measures specific to NFS lands:

- *Timber Removal Plan* (section 4.0);
- *Fire Prevention and Suppression Plan* (section 5.0);
- *Blasting Plan* (section 6.0);
- *Upland Erosion Control Plan* (section 8.0);
- *Stream and Wetland and Crossing Procedures* (section 9.0);
- *Restoration and Rehabilitation Plan* (section 10.0);
- *Non-Native Invasive Plant Species Management Plan* (section 11.0);
- *SPCC Plan* (section 12.0);
- *Fugitive Dust Control and Mitigation Plan* (section 16.0);
- *Off Highway Vehicle Blocking Plan* (section 18.0); and
- *Visual Resources Plan* (section 20.0).

As described in the *COM Plan*, Atlantic would implement measures to comply with the MNF and GWNF LRMPs issued in 2011 and 2014 (FS, 2011, 2014), respectively. The LRMPs are comprehensive planning documents designed to guide land management decisions within the National Forest boundaries. The LRMPs describe management direction and practices, resource protection methods and monitoring, desired resource conditions, and the availability and suitability of lands for resource management. Vegetation mitigation measures unique to federal lands are discussed below.

The *COM Plan* identifies a variety of seed mixes, including regionally specific and native forb (flowering plant) mixes in its traditionally all-grass seed mixes, pollinator-friendly species, and seeding techniques appropriate to the various conditions expected to be found along the pipeline route in the MNF and GWNF. All seeding on NFS lands would be conducted according guidance documents prepared by the FS. The species of grasses, forbs, shrubs, shallow-rooted trees, and specific revegetation techniques used on NFS lands were selected based on consultation with the MNF and GWNF. In addition, Atlantic has committed to including species-specific tree and shrub seedlings and/or seed mixes to enhance wildlife habitat for certain RFSS species discussed in section 4.7.3 and tables R-1 and R-2 of appendix R. The incorporation and development of native flowering plants on the operational right-of-way for the pipeline could create substantial acreages of pollinator habitat where conditions and land management practices are suitable.

The following are a subset of the avoidance and minimization measures identified in the *COM Plan* that Atlantic would implement during construction and/or operations to avoid or further reduce impacts on vegetation resources:

- Methods for soil restoration (e.g., removal of excavated rock, distribution of rock on the work area, grading to preconstruction contours to the extent practicable, and testing and treatment of soil compaction where requested by FS).

- Topsoil segregation, replacement, and conditioning to help re-establish native plant communities in areas determined in consultation with FS and according to the *COM Plan*.

- Special procedures for steep slope areas (e.g., the use of additional structural materials and targeted mitigation of seeps, springs, or other subsurface water encountered).

- Restoration monitoring and maintenance (e.g., assessment of the effectiveness of erosion control measures, assessment through quantitative analysis of ground cover in monitoring plots, monitoring of vegetation for the life span of pipeline operations).

- Implementation of a restoration goal of reseeded/replanted species is equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met.

- Reporting restoration status and remedial actions to the FS and FERC through summary reports.

- Training for EIs regarding the *Restoration and Rehabilitation Plan* (section 10.0 of the *COM Plan* [appendix G]), including techniques specific to the FS, seeding techniques on steep slope sites, emergency contacts and numbers, and erosion minimization and control measures.

- All ATWS and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, would be replanted with a combination of indigenous tree and shrub seedlings on NFS lands per the *COM Plan*. The mix of tree and shrub species would be determined in consultation with the FS.

- Right-of-way edges would be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Employment of the least intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further reduce habitat impacts.

- Installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain.

- Limit vegetation clearing in wetlands to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. Stump removal, grading, topsoil segregation, and excavation would generally be limited to the area immediately over the trench, or where stump removal or grading is required to ensure safe passage of equipment through the wetland.

As discussed in the *COM Plan,* timber cruises would be conducted prior to construction to determine timber volumes, values, and species composition. Results of the timber cruises would be used to develop a *Timber Extraction Plan*, which would identify areas containing merchantable timber.

In addition, to avoid potential adverse impacts on wildlife and wildlife habitat, the FS has recommended no burning on NFS lands. Large woody debris from cleared vegetation and stumps would be placed along the edge of the right-of-way to minimize the potential for soil erosion and sedimentation.

The material would be placed in a manner that would not impede natural drainage, and gaps would be left at intervals to provide passage for wildlife and human uses on NFS land. If any cleared vegetation must be chipped on-site, Atlantic would haul chips off the right-of-way to a disposal site off NFS land. Atlantic will work with the FS to finalize the *COM Plan* with this requirement.

Old growth forest surveys would also be conducted using the criteria in *Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region* (FS, 1997). Because the old growth surveys have not been completed, the acres of old growth forests (as defined by the Regional Guidance) impacted by construction and operation of the pipeline are not yet available. However, we can estimate the acres of "possible old growth" that would be impacted. It is important to note that age is not the only criteria defining old growth, so this process is not a replacement for field inventory to meet the Regional Guidance. However, it can provide an estimation of the impacts on old growth. Table 4.4.8-1 displays the results of this analysis.

TABLE 4.4.8-1

Acres of Possible Old Growth Community Types Affected by the Atlantic Coast Pipeline on the George Washington National Forest

Major Forest Community Type [a]	Possible Old Growth (acres) [b]
Dry-Mesic Oak Forests	53.5
Dry and Dry-Mesic Oak-Pine Forest	1.6
Xeric Pine and Pine-Oak Forest and Woodland	26.5
TOTAL	**81.6**

[a] Forest Community Type provided by the FS.

[b] Possible old growth is defined as Forest stands that meet one or more of the preliminary inventory criteria from the Regional Guidance. Based on the FS forest inventory data, forest types were aggregated into the proper old growth community type and those stands were then identified as possible old growth.

Construction of ACP would convert mature and/or old growth forests to herbaceous habitat, while the balance of the acres would be converted to an early successional condition. Approximately 26 percent of the acres cleared for construction and operation of ACP are considered possible old growth. The three major forest community types receiving the impacts on possible old growth are also the most common community types on the GWNF, and these community types have the highest representation of possible old growth throughout the NSF lands. Considering the clearing of these acres, there will still be an estimated 345,000 acres of possible old growth in these three community types across the GWNF and Jefferson National Forest in 2020, which represents about 37 percent of the acres in the three major community types.

As part of its application for a Right-of-Way Grant, Atlantic is coordinating with the FS on the details to be contained in the *COM Plan*.

4.4.9 Noxious Weeds and Invasive Plants on Federal Lands

EO 13112 directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species can cause. The EO further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions. EO 13112 defines an invasive species as a species that is non-native (or alien) to the ecosystem under consideration; and, whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

The NFS Framework prioritizes and guides the prevention, detection, and control of invasive insects, pathogens, plants, wildlife, and fish that threaten terrestrial and aquatic ecosystems. The Framework directs national forests to incorporate invasive species prevention, detection, and control, including rapid response activities and restoration considerations in their forest plans (FS, 2013).

Atlantic conducted field surveys for NFS-listed non-native invasive plant species within a 300-foot-wide corridor along the proposed ACP pipeline route in the MNF and GWNF. The *Non-Native Invasive Plant Species Management Plan* (section 11.0 of the *COM Plan* [see appendix G]) identifies the construction procedures and mitigation measures that would be used to prevent and control the spread of non-native invasive plant species within the National Forests. On January 27, 2017, Atlantic filed appendix J to the *COM Plan*, which identifies the invasive plant species population by milepost, whether it is proximity to any RFSS or aquatic features, and the proposed herbicide, rate of application, timing of application, and primary and secondary treatment methods for each site on the MNF and GWNF. The FS is reviewing the *COM Plan*, and will coordinate with Atlantic on the final plan.

A summary of the non-native invasive plant species, surveyed through July 16, 2016, identified in the MNF and GWNF is provided below.

4.4.9.1 Monongahela National Forest

Atlantic identified six non-native invasive species along the ACP project area on the MNF (see table 4.4.9-1). Four of the non-native invasive species identified are considered by the FS to be a severe threat and highly invasive. The most predominant non-native invasive species surveyed were garlic mustard, followed by Japanese stiltgrass, Japanese barberry, autumn olive, crown vetch, and colt's-foot.

TABLE 4.4.9-1

Non-Native Invasive Species Surveyed Along the Atlantic Coast Pipeline on the Monongahela National Forest

Scientific Name	Common Name	Rank [a]
Alliaria petiolata	Garlic mustard	1
Berberis thunbergii	Japanese barberry	2
Elaeagnus umbellata	Autumn olive	1
Microstegium vimineum	Japanese stiltgrass	1
Securigera varia (synonym *Coronilla vania*)	Crown vetch	1
Tussilago farfara	Colt's-foot	3

[a] Risk Rankings: (1) species is considered a severe threat and is a highly invasive non-native plant are known to invade natural habitats and replace native species.(2) species considered are less invasive than those with a ranking of 1 with less impact on native plant communities generally found in disturbed areas but are capable of spreading into adjacent undisturbed areas, but are generally found in disturbed areas, are capable of spreading into adjacent undisturbed areas, and pose a significant threat. (3) species pose a lesser threat, and are non-native plants normally found, spread, and remain in areas of ground disturbance with full sunlight or partial shade. (4) species that are problematic elsewhere including parts of West Virginia but whose status is unknown within the MNF. These species are on the MNF "watch list."

Source: FS, 2016a.

4.4.9.2 George Washington National Forest

Atlantic identified 17 non-native invasive species along the ACP project area on the GWNF (see table 4.4.9-2). The most prevalent species observed included garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), Japanese stiltgrass (*Microstegium vimineum*), and crown vetch (*Securigera varia)*. Garlic mustard was the most prevalent in rich substrate forest community types where soil disturbance is evident from past silvicultural practices. These forest communities were also interspersed with isolated occurrences of Japanese barberry and Multiflora rose.

Roadside communities had low to moderate abundance of Japanese stiltgrass and crown vetch, but with little interspersion into adjacent natural communities.

TABLE 4.4.9-2

Non-Native Invasive Species Surveyed Along the Atlantic Coast Pipeline on the George Washington National Forest

Scientific Name	Common Name	Category [a]
Alliaria petiolata	Garlic mustard	1
Berberis thunbergii	Japanese barberry	1
Celastrus orbiculatus	Oriental bittersweet	1
Elaeagnus pungens	Thorny olive	2
Elaeagnus umbellata	Autumn olive	1
Glechoma hederacea	Ground ivy or Gill-over-the-ground	NA
Lespedeza cuneata	Sericea lespedeza	1
Lonicera japonica	Japanese honeysuckle	1
Lonicera morrowii	Morrow's honeysuckle	1
Microstegium vimineum	Japanese stiltgrass	1
Populus alba	White poplar	NA
Rosa multiflora	Multiflora rose	1
Rubus phoenicolasius	Wineberry/wine raspberry	NA
Rumex acetosella	Red sorrel	NA
Securigera varia	Crown vetch	2
Stellaria media	Common chickweed	NA
Tussilago farfara	Colt's-foot	NA

[a] Category 1 species are defined as exotic species that are known to be invasive and persistent throughout all of most of their range within the Southern Region. They can spread into and persist in native plant communities and displace native plant species and therefore pose a demonstrable threat to the integrity of the natural plant communities in the Region. Category 2 species are defined as exotic plant species that are suspected to be invasive or are known to be invasive in limited areas of the Southern Region. Category 2 species will typically persist in the environment for long periods once established and may become invasive under favorable conditions. NA – no assigned category.

Source: Center for Invasive Species and Ecosystem Health, 2016.

Atlantic does not propose the wide-scale use of pesticides and/or herbicides; however, it is reasonably foreseeable that the use herbicides for the control of non-native invasive plants along the right-of-way on the GWNF and the MNF would be necessary. Pesticides and herbicides would be applied in compliance with ACP's *COM Plan* and the FS' Forest Plan Standards and Guidelines for herbicide use, and would comply with all label instructions as well as applicable state and federal regulations. Each location for application of herbicides on NFS land would be coordinated with and approved by the FS.

Effects to soil and water resources may include some limited drift from fine mists during application. Once in the soils, some herbicides can migrate via gravity, leaching, and surface runoff to other soils, groundwater, or surface water. To determine the level of risk for accumulation of herbicide residues on soils and possible contamination of ground and surface water, factors such as persistence (measured in half-life), mobility, and mechanisms for degradation have been reviewed (FS, 1989). However, many of the herbicide treatments would be applied directly to targeted species and relatively little herbicide would contact the soil. Due to the limited acreage and dispersed extent of the areas, and the short half-lives of the chemicals proposed for use, the effects would be temporary and minor.

For vegetation, the reduction in non-native invasive plants would benefit associated native plants, helping to restore native plant communities to their natural associated species assemblage. Herbicide treatments may result in effects to non-target vegetation. However, these effects would be minimal since most treatments would be applied with either hand-held or backpack spray equipment. Any adverse effects to non-targeted plants would be localized and temporary.

For mammals, birds, terrestrial insects, and reptiles, all relevant hazard quotients meet the standard of 1.0 or less indicating a generally acceptable risk to terrestrial mammals (FS, 2017c). With regards to aquatic species, no herbicide would be directly applied to open water. Because all herbicide treatments on NFS land would follow label directions, appropriate mitigations, and FS standards and guidelines, serious negative effects to aquatic species are not expected.

Herbicide treatment methods would pose relatively little safety risk to workers or the public. All relevant hazard quotients meet the standard of 1.0 or less indicating a generally acceptable risk to both workers and the public. In the case of fosamine ammonium, the realistic estimated dose is well below the 1/5 of Lethal Dose 50 risk level used by the EPA indicating a generally acceptable risk to both workers and the public (FS, 2017c).

4.4.10 Conclusion

Based on our review of the potential impacts on vegetation as describe above, we conclude that the primary impact from construction and operation would be on forested areas crossed by ACP and SHP, including the removal of 6,136.6 acres of forested vegetation (includes 2,744.7 acres of permanent impacts) and fragmentation of interior forest blocks (see section 4.5.6). Due to the length of time required to recover forested vegetation, these impacts would be considered long-term to permanent. Atlantic and DETI would reduce these impacts through the implementation of their construction and restoration plans (see table 2.3.1-1), in addition to our recommendations made throughout this EIS. However, despite these efforts, we conclude that forested areas would experience significant impacts as a result of fragmentation and where forest land would convert to herbaceous vegetation in the permanent rights-of-way. If approved, Atlantic would maintain a 50-foot-wide permanent right-of-way in upland areas and a 30-foot-wide right-of-way area in wetlands.

4.5 WILDLIFE

4.5.1 Wildlife Resources and Habitat

The project area provides suitable habitat for a wide variety of terrestrial wildlife species, including large and small mammals, reptiles and amphibians, birds (raptors, waterfowl, and songbirds), and invertebrates. Table 4.5.1-1 provides a list of common wildlife species that are documented, or have the potential to occur in ACP and SHP project areas. Aquatic resources and habitat are discussed in section 4.6. The various vegetation communities crossed by ACP and SHP and that serve as wildlife habitat are described by state in section 4.4.1 and appendix Q.

TABLE 4.5.1-1 **Common Wildlife Species Potentially Occurring in the Atlantic Coast Pipeline and Supply Header Project Areas**	
Category	Wildlife Species
MAMMALS	White-tailed deer, black bear, bobcat, gray fox, red fox, gray squirrel, fox squirrel, red squirrel, cottontail rabbit, marsh rabbit, swamp rabbit, raccoon, eastern chipmunk, deer mouse, white-footed mouse, striped skunk, woodchuck, beavers, mink, muskrats, meadow vole, pine vole, eastern mole, least shrew, short-tailed shrew, southern bog lemming, cotton mouse, meadow jumping mouse, Seminole bat, long-tailed weasel, and various bat species and weasels
BIRDS	American black duck, American kestrel, American woodcock, bald eagle, barn owl, belted kingfisher, black-throated blue warbler, blue-gray gnatcatcher, blue-headed vireo, blue-winged warbler, bobolink, brown thrasher, Canada goose, Carolina wren, chipping sparrow, clapper rail, common moorhen, common nighthawk, Cooper's hawk, cormorants, dark-eyed junco, eastern bluebird, eastern Kingbird, eastern meadowlark, eastern towhee, field sparrow, gray catbird, great blue heron, great-horned owl, green heron, hairy woodpecker, herons, hooded merganser, hooded warbler, ibises, least bittern, Louisiana waterthrush, mallard, meadowlark, northern cardinal, northern harrier, northern oriole, orchard oriole, pied-billed grebe, pine warbler, red-headed woodpecker, red-tailed hawk, ruby-throated hummingbird, scarlet tanager, sedge wren, short-eared owl, various shorebirds, whip-poor-will, white-eyed vireo, willow flycatcher, Wilson's plover, wood duck, wood thrush
REPTILES/AMPHIBIANS	Bog turtle, box turtle, eastern box turtle, eastern musk turtle, painted turtle, snapping turtle, spotted turtle, common garter snake, corn snake, eastern garter snake, eastern hog-nosed snake, eastern indigo snake, eastern milk snake, northern scarlet snake, northern water snake, scarlet kingsnake, smooth green snake, milk snake, eastern spadefoot, marbled salamander, northern red salamander, northern slimy salamander, seal salamander, spotted salamander, red-spotted newt, common five-lined skink, fence lizard, dusky salamander, southern dusky salamander, eastern cricket frog, American bullfrog, American toad, spring peeper
TERRESTRIAL INVERTEBRATES	Land snails, tiger beetles, bumble bee, carpenter bee, gossamer-winged butterfly, milkweed butterfly, viceroy butterfly, spicebush swallowtail, Carolina satyr butterfly, cabbage white, black swallowtail, eastern tiger swallowtail, Palamedes swallowtail, orange sulphur, sleepy orange, pearl crescent, common buckeye, silver spotted skipper, gypsy moth

Source: WVDNR, 2015a; VDGIF, 2015b, NCWRC, 2015a.

4.5.1.1 Mammals

Mammals within the ACP and SHP project area could be found in all habitat types crossed by projects (see section 4.4). Some more sensitive habitat types include caves, talus, boulderfield and cliff habitat, red spruce/northern hardwood forests, floodplain forest communities, and grassland/meadows or other types of open habitats, largely due to the limited nature of these habitat types in portions of the project area. Caves serve as habitat for many bat species and can be degraded by repeated disturbance or changes to cave microclimates. The white nose syndrome (WNS) caused by the fungus *Pseudogymnoascus destructans* affects bats during hibernation and has contributed to significant declines in several bat species across the United States. Generally, adult bat species can move away from disturbance; however, construction activities can cause mortality of young bats, cause and/or contribute to the loss of roosting, maternity colony, and foraging habitat, cause noise and vibration disturbance to hibernating bats, and nighttime lighting can also disturb foraging bats (WVDNR, 2015a). Section 4.7.1 provides a discussion of potential impacts and conservation measures for ESA-listed bat species that have the potential to occur in the ACP and SHP project area. Section 4.7.3 discusses FS-managed species, and section 4.7.4 discuss state-listed and sensitive species.

Species such as the eastern small-footed bat and Allegheny woodrat are associated with rocky habitats (talus/boulder fields/cliffs), which are restricted to certain geologic formations and are concentrated in certain areas of Virginia and West Virginia. The Allegheny woodrat is greatly affected by habitat fragmentation, and eastern small-footed bat maternity colonies are highly susceptible to disturbance and habitat degradation during the maternity season. Red spruce/northern hardwood forest habitat have also declined due to large-scale logging and fires in the early 1900s; thus, the species that utilize these habitats have also seen declines, such as the West Virginia northern flying squirrel, southern water shrew, and snowshoe hare. Open habitat types (e.g., meadows, grasslands) are limited in West Virginia and Virginia, and are threatened by conversion to agriculture or other developments. Species that use these habitats include least shrew, southern bog lemming, and meadow jumping mouse (WVDNR, 2015a).

Most mammal species can move away from localized disturbances and the associated dangers of noise and vibrations, increased use of access roads, and construction equipment moving along the right-of-way. However adult small mammals, especially woodrats, mice, shrews, moles, and voles are not as able to move away from construction disturbance given their small size, nocturnal nature, underground denning and nesting habitat, and small home ranges. For these reasons, construction activities such as vegetation clearing, blasting, trenching, and heavy vehicle use could cause direct mortality to juvenile and adult small mammals. Additionally, direct mortality and decreased forage due to non-native invasive plant introduction and spread is possible during continued routine maintenance of the right-of-way areas for the active life of the pipeline.

4.5.1.2 Birds

Birds occupy a variety of habitats and use diverse foraging strategies. Aerial insectivores, such as the Eastern whip-poor-will and several swallow species, capture insect prey while in flight. Birds that use early successional habitat, such as ruffed grouse and golden-winged warbler, rely on disturbance intermixed within a largely forested matrix to maintain their preferred habitats. These species could benefit from the periodic maintenance of utility rights-of-way, such as the ACP and SHP permanent right-of-way, if the appropriate type and structure of early successional habitat is maintained within the rights-of-way. In North Carolina, floodplain forests serve as habitat for many songbird species (NCWRC, 2015a). Species such as the broad-winged hawk, Swainson's warbler, and cerulean warbler require large intact interior forest habitats. Fragmentation and loss of interior forest habitats have contributed to the decline of some of these species both directly and indirectly, as creation of edges also contributes to the introduction of invasive species, mortality from predation, and brood parasitism by the brown-headed cowbird. Grassland bird species include the loggerhead shrike and Henslow's sparrow; several of these species have seen declines due to fragmentation of suitable habitat, such as the conversion of grassland to agriculture. High elevation forest and wetland species including the yellow-bellied sapsucker, blackburnian warbler, northern goshawk, and northern saw-whet owl are generally restricted to these habitat types. Finally, there are variety of waterfowl and shorebird species that prefer wetland and waterbody habitats, including great blue heron, upland sandpiper, and Wilson's snipe (WVDNR, 2015a). In North Carolina, pocosins provide important wintering habitat for birds (NCWRC, 2015a). Impacts and conservation measures associated with raptors and other migratory birds are discussed in more detail in section 4.5.3.

4.5.1.3 Amphibians/Reptiles

Amphibians can be found in a great variety of habitats and elevations throughout the area. Aquatic salamanders are found in and around streams and riparian areas, while terrestrial salamanders can be found in forests, as well as restricted habitat types such as rock outcroppings. Most amphibians require some type of aquatic habitat for breeding, and moisture, humidity, and temperature levels can affect their habitat quality, and thus distribution. Vernal pools are important breeding sites for many species of early-breeding salamanders, frogs, and toads across the country. In the mountains of West Virginia and Virginia, sparsely scattered vernal pools are the main breeding location of species such as the spotted salamander, wood frog, and spring peeper (WVDNR, 2015a; Vuocolo et al., 2016). In North Carolina, the clay-based Carolina Bay wetlands provide important breeding sites for amphibians because they rarely contain fish. In addition, the unique long-leaf pine communities are important to several rare amphibian and reptile species, such as the Carolina gopher frog and the eastern diamond-backed rattlesnake, particularly where ponds are embedded in savannas or flatwoods (NCWRC, 2015a). Habitat fragmentation can threaten population viability of these species by eliminating wildlife corridors and limiting their ability to access breeding areas; most species do not have a wide range, thus localized impacts can be significant (WVDNR, 2015a). Loss of vernal pools in the landscape and degradation of the forest habitat surrounding them is also a major threat to the viability of many species of amphibians (Vuocolo et al., 2016). Fragmentation and loss of forest cover is a primary concern for Appalachian endemic salamanders, as it can cause changes to microclimates, and remove important habitat characteristics (e.g., downed woody debris, leaf litter accumulation) (WVDNR, 2015a).

Like amphibians, reptiles also utilize numerous habitat types, both wet and dry, across the project area. Terrestrial lizards, skinks, racerunners, snakes, and turtles inhabit a variety of habitats including forests, wetlands, pastures, rocky outcrops, and meadows. Aquatic reptiles inhabit streams, rivers, ponds, lakes, and coastal marshes and bays. Many species have very specific habitat requirements, and many are threatened by habitat loss and degradation, fragmentation, and introduction of invasive species (e.g., cats). Barriers to wildlife movement corridors also threaten species with more limited ranges.

Many amphibians and reptile species are not as able to move away from construction disturbance given their small size, nocturnal nature, underground roosting and nesting habitat, and small home ranges. For these reasons, construction activities such as vegetation clearing, blasting, trenching and heavy vehicle use could cause direct mortality to both juvenile and adult amphibians and reptiles. Additionally, direct mortality is possible during continued routine maintenance of the right-of-way areas for the active life of the pipeline. Due to high site fidelity to breeding grounds, it is possible that construction activities that impact and alter vernal pool habitats could cause localized population declines of various amphibian species. Also, certain species of reptiles, such as rattlesnakes, could be locally extirpated if hibernating or gestational dens are destroyed during construction.

4.5.1.4 Terrestrial Invertebrates

There are hundreds of species of snails in the ACP and SHP project area; most of these species are found among the leaf litter, logs, or rocks of forested habitats, while others prefer cliffs, wetland habitats, or dry open habitats. Degradation of habitat, such as disturbance and compaction of leaf litter, caused by activities such as increased foot traffic, fires, and invasive plants can negatively affect these forest-dwelling species (WVDNR, 2015a). Additionally, reduction in forest canopy and shrub layers can cause desiccation of the soil, leaf litter, duff, and downed woody debris, making them unsuitable habitat for egg deposit and refugia for land snails. Removal of coarse and fine woody debris and rocks from the forest floor can lead to a decrease in available refugia for snails, while changes in soil chemistry, soil temperature, and ultraviolet light exposure due to reduction in canopy cover can also have detrimental impacts on snails. Invasive plant species can change soil microclimate, as well as outcompete native plant food sources. Finally, contamination of the soil or water from fuels, chemicals, or runoff is likely to lead to a localized decline in snail population at the contaminated site (Jordan and Black, 2012).

Tiger beetles generally occupy open areas with little vegetation cover, such as riparian habitat, along dirt roads, or near barrens; however, each species is specially adapted for certain habitat requirements. These species are highly sensitive to changing environmental conditions, and are good bio-indicators of ecosystem health (Allen and Acciavatti, 2002).

Dragonflies and damselflies are generally associated with wetland and waterbody habitats from low to high elevations, including streams, rivers, seeps, streamlets, marsh ponds, fishless ponds, and wetland habitats. Although adult dragonflies and damselflies are mobile, their larvae inhabit flowing waters and wetlands and are susceptible to degradation in water quality from runoff, which leads to increased sedimentation and potential chemical or heavy metal contamination of the water. Additionally, development and changes in the landscape, such as road construction, housing developments, and installation of utility corridors can lead to the loss of small wetlands and vernal pools that are primary breeding grounds for local dragonfly and damselfly populations (WVDNR, 2015a).

Hundreds of species of Lepidoptera (butterflies, skippers, and moths) can be found in any habitat in the region (including shale barrens and all forests types) at any elevation, and in wet meadows and edges (WVDNR, 2015a). While many plant species are utilized for nectaring by adult Lepidoptera, the larvae tend to require very specific plant species hosts. Females of each species deposits eggs on one or more species of specific larval host plant(s) where the larvae will hatch. Each species also has one or more species of foraging plants. Therefore, direct removal of larval host plants and foraging plants can be detrimental to these insects. In addition, the introduction and spread of invasive plants that are unrecognizable as unsuitable host plants to adults during egg-laying; as well as1) invasive insects that compete with larvae for food sources (e.g., gypsy moth), 2) the pesticides used to control their spread of these invasives, and 3) plant diseases, have contributed to the decline of many Lepidopteran species. Although most adult butterflies, skippers, and moths are mobile, and can disperse away from disturbances, some adults are weak flyers, or adverse to crossing open areas, such as the West Virginia white butterfly. Eggs and larvae on larval host plants are not mobile and disturbance can lead to direct mortality. Additionally, although adult Lepidopterans can fly away from disturbance, they do not appear to be aware of human-caused dangers and do not often demonstrate avoidance to anthropogenic threats. Male butterflies, skippers, and moths can be found puddling (gathered together near puddles or feces deposits) to acquire minerals for themselves and breeding females. Puddling individuals, as well as those nectaring and migrating, are often struck by traffic. Increased traffic on access roads and other roads used during the project will likely lead to increased road mortality of various Lepidoptera species.

4.5.1.5 Pollinator Habitat

On June 20, 2014, President Barack Obama signed a Presidential Memorandum titled “Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators.” According to the memorandum, “there has been a significant loss of pollinators, including honey bees, native bees, birds, bats, and butterflies, from the environment.” The memorandum also states that, “given the breadth, severity, and persistence of pollinator losses, it is critical to expand federal efforts and take new steps to reverse pollinator losses and help restore populations to healthy levels.” In response to the Presidential Memorandum, the federal Pollinator Health Task Force published a National Strategy to Promote the Health of Honey Bees and Other Pollinators in May 2015. This strategy established a process to increase and improve pollinator habitat.

Pollinator habitat in and adjacent to the ACP and SHP project area can be found in a variety of vegetation types, including upland, open land, forested land, forested wetland, emergent wetland, and scrub-shrub wetland. Common pollinators include species of ants, bats, bees, birds, beetles, butterflies, moths, flies, and wasps (FS, 2016b).

Construction of ACP and SHP would temporarily impact about 7,509 acres of pollinator habitat (including forests, scrub-shrub, grasslands/herbaceous, barren land, woody wetlands, and emergent wetlands). The temporary loss of this habitat would increase the rates of stress, injury, and mortality experienced by honey bees and other pollinators. Atlantic’s and DETI’s *Restoration and Rehabilitation Plan* (see appendix F) outlines the seed mixes and restoration practices that would be used along the pipeline route, and includes a section on pollinator habitat planting and maintenance. Some seed mixes would incorporate regionally specific and native forb (flowering plant) mixes in its traditionally all-grass seed mixes to provide food and habitat for pollinators and local wildlife species. Pollinator species would be planted in the construction and permanent rights-of-way, and once revegetated, would provide pollinator habitat after the first or second growing season, and may naturally improve pollinator habitat along the project areas. Atlantic continues to coordinate with the appropriate agencies to identify seed mixes and practices. Atlantic would include final seed mixes in the final *Restoration and Rehabilitation Plan* prior to construction.

4.5.2 Sensitive or Managed Wildlife Habitats

Sensitive or managed wildlife habitats such as NWRs, NFS lands, state parks and forests, WMAs, and reserve program lands are generally established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational and consumptive uses. Most of these sensitive and managed lands are discussed throughout this EIS, such as the unique, sensitive, and protected vegetation communities identified in section 4.4.2, or the recreational areas identified in section 4.8.5. Other sensitive areas that provide wildlife habitat can occur on both managed and private lands, such as underground caves.

4.5.2.1 Lewis Wetzel Wildlife Management Area

The TL-635 loopline route crosses approximately 3.7 miles of WVDNR land in the Lewis Wetzel WMA located in Wetzel County, West Virginia. This WMA provides hunting, fishing, camping, and shooting opportunities. Impacts on recreational activities are discussed further in section 4.8.5. The WVDNR requested DETI conduct surveys for bats and bat hibernacula, Allegheny woodrat, and timber rattlesnake. Northern long-eared bats were detected at three acoustic sites on the Lewis Wetzel WMA in 2015. Six northern long-eared bats were captured in mist nets when these sites were surveyed again in 2016. Also, five potential hibernacula were surveyed and determined to be unsuitable bat habitat. See section 4.7.1.4 for further discussion on the federally threatened northern long-eared bat. In addition, DETI's surveys within the WMA resulted in no observations of Allegheny woodrat, but identified one low quality suitable habitat outside of the survey corridor. No timber rattlesnakes were observed, but five low quality suitable habitat locations were identified. Additional discussion of Allegheny woodrat and timber rattlesnake in West Virginia can be found in section 4.7.4 and table S-1 of appendix S; and within the MNF in section 4.7.3 and table R-1 of appendix R.

Following construction, DETI would utilize seed mixes within the Lewis Wetzel WMA that were identified in coordination with the WVDNR, and that are incorporated into the *Restoration and Rehabilitation Plan* (see appendix F).

4.5.2.2 Seneca State Forest

The proposed AP-1 mainline route crosses approximately 4.8 miles of the Seneca State Forest in Pocahontas County, West Virginia. The crossing of the Seneca State Forest occurs between approximate AP-1 MPs 76.9 and 79.2 and AP-1 MPs 79.4 and 80.5. The forest is managed by the WV State Parks and WVDOF. This forest is used as a recreational site for hiking, fishing, hunting, and camping. Impacts to recreational activities and timber are discussed further in section 4.8.5.

During 2016 surveys, Atlantic observed six timber rattlesnakes and suitable habitat within the Seneca State Forest adjoining the MNF approximately 1.5 miles from the survey corridor. Atlantic also conducted northern goshawk surveys within the Seneca State Forest; however, no goshawk activity was observed. Additional discussion of timber rattlesnake and northern goshawk in West Virginia can be found in section 4.7.4 and table S-1 of appendix S; and within the MNF in section 4.7.3 and table R-1 of appendix R.

Additionally, Atlantic conducted bat habitat assessment surveys in 2015 and 2016 for federally listed and MNF Regional Foresters' Sensitive Species (RFSS) bats in West Virginia. Of the twelve acoustic sites surveyed on the Seneca State Forest, four sites had detections (two sites for Indiana bat and northern long-eared bat, and two sites for northern long-eared bat only). There were no captures in mist netting at one site. Mist netting at the remaining three sites will be conducted in 2017. See sections 4.7.1.3 and 4.7.1.4 for further discussion on the federally endangered Indiana bat and federally threatened northern long-eared bat, respectively.

As discussed in section 4.4, Atlantic recently drafted an Order 1 soil survey to further refine seed mixes to be used within the Seneca State Forest. Upon review of the Order 1 soil survey, the WVDOF will provide recommended seed mixes to be used along the right-of-way. Because Atlantic's *Restoration and Rehabilitation Plan* does not yet incorporate the WVDOF's recommended mitigation measures or seed mixes for the Seneca State Forest we have recommended that Atlantic file a final *Restoration and Rehabilitation Plan* prior to construction.

4.5.2.3 James River Wildlife Management Area

ACP crosses the James River WMA, which is managed by the VDGIF, intermittently between AP-1 MPs 183.3 and 184.7 (1.3 miles), on the western flank of the James River in Nelson County, Virginia. Restoration efforts have been made to enhance upland habitat on the WMA, including planting native species, establishing hedgerows, and the creation of marsh habitat. The WMA can be used for hunting species such as rabbit, deer, turkey and quail. Impacts on recreational activities are discussed further in section 4.8.5. Following construction, Atlantic would utilize seed mixes within the James River WMA that were identified in coordination with the VDGIF, and that are incorporated into the *Restoration and Rehabilitation Plan* (see appendix F).

4.5.2.4 Karst, Cave, and Subterranean Habitat

Cave invertebrates and other subterranean obligate species include a variety of taxonomic groups, including amphipods, isopods, copepods, flatworms, segmented worms, snails, mites, spiders, pseudo-scorpions, diplurans, dipterans, springtails, millipedes, and beetles. These species inhabit specific subterranean microhabitats including:

- cave streams;
- cave riparian areas;
- cave entrances;
- aquatic epikarst (small crevices below the ground surface above the cave passage);
- terrestrial epikarst (small spaces above the cave passage); and
- aquatic phreatic (permanent groundwater below or within the cave).

Many of these species are endemic to only a few known locations, and much is unknown about their biology, range, population, or habitat preferences. Conservation of the cave habitat that these species occupy is important to their survival, which includes the surface habitat, drainage basin and hydrology, and the groundwater system. Sinkholes and sinking streams often are a direct pathway to cave streams and groundwater. Due the connectivity of these systems, and the porous nature of karst, these habitats are also susceptible to pollution. It is important to establish vegetation buffers around karst features; however, because of the underground nature of these systems, these features can be difficult to identify; thus, it is also difficult to establish sufficient protective buffers. Within the ACP project area, habitat for these species are found most extensively in Pocahontas and Randolph Counties, West Virginia, and Highland, Bath, and Augusta Counties, Virginia (WVDNR, 2015a; VDGIF, 2015b). This includes the Burnsville Cove area in Highland and Bath Counties, and Cochran's Cave Conservation Site located in Augusta County, Virginia. Several of the caves found in these areas support ESA- or state-listed bat species, and other sensitive cave obligate species. Federal and state protected, and FS-managed subterranean and cave obligate species are discussed in more detail in section 4.7 and their corresponding appendices (appendices R and S).

Atlantic conducted karst surveys in Pocahontas and Randolph Counties, West Virginia, and Highland, Bath, and Augusta Counties, Virginia in 2016 and 2017. The Final Karst Survey Report identified karst features within these counties; however, due to the underground nature of these systems it is difficult to identify their full extent. Because no additional assessment was made of the karst features to determine whether they are appropriately suitable for any of the cave or subterranean obligate species (except bats), we assume that all karst features are suitable habitat for subterranean obligate species and assume presence of these species. As discussed in section 4.1.2.3, the development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, as discussed in section 4.3.1.7, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's *Karst Mitigation Plan* (appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts. The VDCR-DNH and the Virginia Cave Board have endorsed the revised *Karst Mitigation Plan* as comprehensive and indicate that the measures included would reduce the potential risk posed by ACP to karst resources.

However, both the VDCR-DNH and Virginia Cave Board have made additional recommendations to address impacts if mitigation and protective measures fail and there is a discharge to karst waters, potentially impacting subsurface habitat, drinking water, and surface streams fed by karst springs. The VDCR has indicated that dye traces within the general ACP project area have shown connections of karst features to springs and wells as far away as 7 miles for areas northwest of the Staunton/Pulaski/North Mountain Fault system (e.g., the Ridge and Valley). The VDCR-DNH has recommended performing dye traces, as necessary to determine the subterranean flow of water entering karst features proximal to the ACP construction right-of-way or access roads. In the case of a release (i.e., discharge of sediment or contaminant to a karst feature), the potentially impacted landowner, land-managing agency, or resource managing agency can be informed in a timely manner, and spill recovery equipment can be deployed or other measures implemented at appropriate location[s]. In addition, the Virginia Cave Board has recommended detailed hydrological assessments in karst terrains crossed by the ACP to: 1) avoid (and thus protect) sensitive cave and karst resources, 2) prevent costly mitigation measures to Atlantic resulting from deleterious impacts, and/or 3) mount a rapid response to mitigate against any future unintentional releases of sediment or contaminants along the ACP route. Subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a); therefore, it is possible that impacts associated with construction activities could have population level effects on these species.

On January 27, 2017, Atlantic submitted the Cochran's Cave Conservation Area and Moffet Lake Investigation Update and a revised *Karst Mitigation Plan.* The VDCR continues to recommend avoidance of the Cochran's Cave Conservation Site, but believes the current investigations and ongoing adjustments to the route have reduced the likelihood of a significant impact on the cave or its associated biological and hydrological resources. Atlantic would perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way (see section 4.1.2.3). The locations of known or suspected karst features scheduled for ERI and/or air track drilling would include surveys of karst features located within the Madison Cave isopod priority area (MPs 123.7-149.6) (see section 4.7.1.13), and for karst features located within the construction workspace that are within a 5-mile buffer of currently known or survey identified bat hibernacula (refer to sections 4.7.1.1 through 4.7.1.4).

4.5.3 Raptors and Other Migratory Birds

Migratory birds are protected under the MBTA (16 U.S.C. 703-711). EO 13186 (66 Federal Register 3853) directs federal agencies to identify where unintentional take is likely to have a measurable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS. EO 13186 states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that focus should be given to addressing population-level impacts. Additionally, bald and golden eagles are protected under the BGEPA (16 U.S.C. 668-668d).

On March 30, 2011, the FWS and the FERC entered into a MOU that focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies. This voluntary MOU does not waive legal requirements under the MBTA, BGEPA, ESA, Federal Power Act, NGA, or any other statutes and does not authorize the take of migratory birds.

The 1988 amendment to the Fish and Wildlife Conservation Act mandates that the FWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." As a result of this mandate, the FWS created the Birds of Conservation Concern (BCC) list. The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with EO 13186.

4.5.3.1 Bald and Golden Eagles

Beyond the MBTA, the BGEPA provides additional protection to bald and golden eagles. The BGEPA prohibits the take, possession, sale, offer to sell, purchase, barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. "Take" under this act is defined as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb." Disturb is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." If a proposed project or action occurs in an area where nesting, feeding, or roosting eagles occur, the proponent often needs to implement special conservation measures to comply with the BGEPA.

Atlantic and DETI conducted aerial surveys for bald eagle nests and golden eagle winter roosting locations in 2015 and 2016. Golden eagle winter roosting locations are known from eastern West Virginia and western Virginia, along ridges and in areas of higher elevation. Bald eagles are known to occur year-round in the project area. Aerial surveys documented three bald eagle nests near the ACP project area in Virginia. Nest ID BAEA-ACT-06 in the City of Chesapeake was located within the 660-foot nest buffer; however, pedestrian surveys in December 2016 did not document evidence of the nest. During surveys on March 23, 2017, a bald eagle nest was identified 540 feet southeast of the BAEA-ACT-06 location; this nest, BAEA-ACT-06A, is 320 feet from the proposed project workspace. BAEA-ACT-06A is within the recommended 660-foot nest buffer, 330-foot no vegetation clearing buffer, and 0.5-mile buffer for potential blasting activities. Nest ID BAEA-ACT-01 in Nottoway County is located within the recommended 660-foot nest buffer, 330-foot no vegetation clearing buffer, and 0.5-mile buffer for potential blasting activities. Nest ID BAEA-ACT-05 in Augusta County is located outside the construction workspace and the recommended buffers; however, it is within 0.5 mile of potential blasting activities. Seven observations of golden eagles were made in Randolph County, West Virginia and Highland and Bath Counties, Virginia during surveys in 2016. No bald eagle nests were identified in the SHP project area during the surveys.

4.5.3.2 Bird Conservation Regions and Birds of Conservation Concern

Bird Conservation Regions (BCRs) are regions in North America that are ecologically distinct and that have similar migratory bird communities, habitats, and natural resource issues (North American Bird Conservation Initiative, 2013). ACP crosses BCR 27 – Southern Coastal Plain, BCR 28 – Appalachian Mountains, and BCR 29 – Piedmont. SHP crosses BCR 28 (see figure 3.1-1 and table A-1 in the *Migratory Bird Plan* [see table 2.3.1-1]). The FWS developed a list of BCC for each BCR. BCC are birds that may warrant protection under the ESA in the future if conservation and management efforts are not focused on them (FWS, 2008a). Based on EO 13186, federal agencies are encouraged to focus conservation measures on BCC. Atlantic and DETI identified 54 species of BCC in the ACP and SHP project areas through the FWS' Information, Planning, and Conservation System. The *Migratory Bird Plan* includes a complete list of BCC (see table A-1 in the *Migratory Bird Plan*).

The NCWRC provided comments that the following species also occur in North Carolina: American oystercatcher, Bewick's wren, black skimmer, black-throated green warbler, golden-winged warbler, gull-billed tern, least tern, lesser yellowlegs, Louisiana waterthrush, northern saw-whet owl, olive-sided flycatcher, pied-billed grebe, red-headed woodpecker, short-billed dowitcher (does not breed in North Carolina), snowy egret, whimbrel (does not breed in North Carolina), willow flycatcher, black-billed cuckoo, blue-winged warbler, Canada warbler, and yellow-bellied sapsucker. Atlantic will file a revised *Migratory Bird Plan* prior to construction that includes these revisions.

4.5.3.3 Important Bird Areas

Important Bird Areas (IBAs) are sites that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds. IBAs may cover a few acres or thousands of acres, but usually they are discrete sites that stand out from the surrounding landscape. IBAs may include public or private lands, or both, and they may be protected or unprotected (National Audubon Society, 2016a). The FERC and FWS MOU requires the agencies and Applicants to identify measures to protect, restore, and manage, as practicable, IBAs, and other significant bird sites that occur on lands impacted by projects.

We received comments on the draft EIS regarding the IBAs crossed by the ACP, specifically the omission of the Allegheny Mountains Forest Block Complex. Based on digital mapping (National Audubon Society, 2016b), three additional IBAs (Virginia Piedmont Forest Block Complex, Allegheny Mountains Forest Block Complex, and the Southern Allegheny Plateau Forest Block Complex) are crossed by ACP and SHP. Table 4.5.3-1 has been updated to include the 10 IBAs that would be crossed by ACP and SHP.

TABLE 4.5.3-1

Important Bird Areas Crossed by the Atlantic Coast Pipeline and Supply Header Project

Important Bird Area	Project Component	Milepost	Ornithological Summary
VIRGINIA			
Allegheny Highlands (Site 2371)	ACP AP-1	84.0 to 97.2	This site is a known as a population stronghold for the golden-winged warbler, an FWS high-priority species found only at elevations above 2,000 feet in appropriate successional habitat. Other important species dependent on shrubland habitat include the northern bobwhite, brown thrasher, blue-winged warbler, Kentucky warbler, prairie warbler, yellow-breasted chat, eastern towhee, and the indigo bunting. Mixed hardwood forests support diverse and abundant breeding bird populations including a suite of at-risk Neotropical migrants, such as cerulean warbler, an FWS high-priority species. Intact high-elevation forest tracts support uncommon Virginia species such as the blackburnian warbler, Canada warbler, mourning warbler, Swainson's thrush, northern saw-whet owl and Appalachian winter wren. This area also appears to be a very important migratory pathway for Neotropical migrants.
Upper Blue Ridge Mountains (Site 2148)	ACP AP-1	152.1 to 161.8	Dry ridges and cove forests support what is likely the largest population of cerulean warblers in Virginia. The large extent and diversity of forest communities support significant populations of Neotropical migrants and numerous mature deciduous forest species of regional responsibility. It is one of the most significant fall raptor flyways in Virginia, supporting thousands of raptors each year and serving as important stopover habitat for hundreds of thousands of migrating passerines.
Central Piedmont (Site 3810)	ACP AP-1	164.0 to 209.4	Forested lands provide essential habitat to many threatened bird species, including the Kentucky warbler, wood thrush and Louisiana waterthrush. The IBA's early to mid-successional habitats provide an important stronghold for birds such as the prairie warbler. Additionally, these early successional grassland and shrub/scrub habitats are known to host four of the ten species identified as the top ten common birds in decline: Northern bobwhite (also listed as a species of global. conservation concern), Eastern meadowlark, field sparrow, and grasshopper sparrow
Great Dismal Swamp (Site 1988)	ACP AP-3	66.3 to 76.1	The Great Dismal Swamp is one of the only known places in Virginia to support the Wayne's warbler, a coastal subspecies of the black-throated green warbler. It also supports the only known population of Swainson's warblers on the coastal plain.
Virginia Piedmont Forest Block Complex (Site 5068)	ACP AP-1 and AP-3	Various 12.2 to 29.0 211.1 to 289.0	This site was identified through the forest block analysis conducted by the Eastern Forest Project of the National Audubon Society in 2013. The ornithological significance of the site has not been published.
NORTH CAROLINA			
Roanoke River Bottomlands (Site 445)	ACP AP-2	9.2 to 10.2 11.1 to 11.9	With 214 bird species recorded, 88 of which are known to breed, this site is one of the most diverse in the coastal plain. Forty-four species of neotropical migrants are known to breed within the site, and it supports several colonies of wading birds. This site also supports a significant diversity and abundance of neotropical migrant songbirds and wood ducks, and has recently been identified as a globally significant IBA for the cerulean warbler.
Upper Neuse River Bottomlands (Site 393)	ACP AP-2	97.1 to 101.5	This is likely one of North Carolina's most important sites for Mississippi Kites. Supports species associated with bottomland hardwood forests and cypress-tupelo-gum swamp forests.

TABLE 4.5.3-1 (cont'd) **Important Bird Areas Crossed by the Atlantic Coast Pipeline and Supply Header Project**			
Important Bird Area	Project Component	Milepost	Ornithological Summary
WEST VIRGINIA			
Lewis Wetzel WMA (Site 3447)	SHP TL-635	23.5 to 29.4	This site is recognized for its significant cerulean warbler population and other species of conservation concern that depend upon quality mesophytic forest habitat.
Allegheny Mountains Forest Block Complex (Site 5073)	ACP AP-1	59.9 to 68.8 69.2 to 83.9	This site was identified through the forest block analysis conducted by the Eastern Forest Project of the National Audubon Society in 2013. The ornithological significance of the site has not been published.
Southern Allegheny Plateau Forest Block Complex (Site 5072)	ACP AP-1 and SHP TL-635	0.0 to 3.9	This site was identified through the forest block analysis conducted by the Eastern Forest Project of the National Audubon Society in 2013. The ornithological significance of the site has not been published.

Source: National Audubon Society, 2016b.

4.5.3.4 Raptor and Other Bird Surveys

Atlantic and DETI conducted aerial surveys for raptor nests and rookeries in 2015 and 2016, and pedestrian surveys in early 2017. The raptor nests documented in the ACP project area and the rookeries documented in both project areas are provided in the *Migratory Bird Plan* (see table 3.1.1-1 and attachment B of the *Migratory Bird Plan* [see table 2.3.1-1]). DETI did not identify any raptor nests or rookeries in the SHP project area during the review of the Pennsylvania Natural Heritage Inventory (NHI) database or during aerial surveys. Further survey results are summarized below. Atlantic and DETI also conducted surveys for one migratory bird species that have special federal or state status, the red-cockaded woodpecker. The results of these surveys are provided in section 4.7.1.5.

4.5.3.5 General Impacts and Mitigation for Migratory Birds

Construction and operation of ACP and SHP may directly and indirectly affect migratory birds and their habitats. Most of direct impacts would be on nesting birds during construction. If Atlantic and DETI clear the right-of-way during the nesting season, adults and nests with eggs or chicks may be destroyed. In addition, even if nests are located outside the active clearing area, noise from construction activities may disturb and displace nesting adults, potentially leading to mortality of eggs and nestlings due to nest abandonment and interrupted or decreased feeding at the nest. Clearing trees outside of the nesting season would reduce direct impacts on migratory birds because adult and fledged juvenile birds would disperse to adjacent habitat. Additional potential impacts may include temporary or permanent loss of suitable breeding and migration route habitat, and increased habitat fragmentation with associated edge effects (see section 4.5.6). Increased human activity and construction activities would temporarily increase noise levels, which may potentially lead to territory abandonment, decreased fitness, and decreased breeding activity. Also, routine maintenance of the rights-of-way during breeding season has the potential to directly and indirectly affect birds nesting in and near the rights-of-way. The agency-recommended migratory bird buffers and TOYR are described in table 4.5.3-2.

TABLE 4.5.3-2

Agency-Recommended Migratory Bird Buffers and Time of Year Restrictions

Species/Group	Recommending Agency	Agency Recommendation	TOYR
WEST VIRGINIA			
Migratory birds	FWS – West Virginia Field Office	Avoid clearing vegetation during the primary nesting season for most native birds	April 1-August 31
Bald eagle nests and winter roosts	FWS – West Virginia Field Office	Follow National Bald Eagle Management Guidelines (NBEMG) (https://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGuidelines.pdf)	See NBEMG
Bald eagle nests	MNF	1,500-foot no activity buffer	Active eagle nests
Raptor nests	FWS	No activity during active breeding season within 100 feet of nest	Active nesting period (varies by species)
VIRGINIA			
Migratory birds	FWS – Virginia Field Office	Avoid clearing vegetation during the primary nesting season for most native birds	March 15-August 15
Rookeries	VDGIF	No activity during active breeding season within 0.25 mile of edge of rookery. Avoid clearing vegetation within 500 feet of rookery	February 1-July 31
Bald eagle nests	FWS – Virginia Field Office	Follow VA Review Process: https://www.fws.gov/northeast/virginiafield/endangered/projectreviews_step6a.html and NBEMG	See NBEMG
Raptor nests	FWS	No activity during active breeding season within 100 feet of nest	Active nesting period (varies by species)
NORTH CAROLINA			
Migratory birds	FWS – North Carolina Field Office	Avoid clearing vegetation during the primary nesting season for most native birds	April 1-August 31
Rookeries	NCWRC	No activity during active breeding season within 0.5 mile of edge of rookery. Avoid clearing vegetation within 500 feet of rookery	February 15-July 31
Bald eagle nests	FWS – North Carolina Field Office	Follow NBEMG	See NBEMG
Raptor nests	FWS	No activity during active breeding season within 100 feet of nest	Active nesting period (varies by species)
PENNSYLVANIA			
Migratory birds	FWS – Pennsylvania Field Office	Avoid clearing vegetation primarily during the nesting season for most native birds	April 1-August 31
Raptor nests	FWS	No activity during active breeding season within 100 feet of nest	Active nesting period (varies by species)

As described in the *Migratory Bird Plan*, Atlantic and DETI have committed to clearing vegetation outside of the state-specific migratory bird TOYRs (see table 4.5.3-2), and implementing no-activity buffers around active nests for certain species of raptors and rookeries. The FERC *Plan* and *Procedures* (see table 2.3.1-1) require that maintenance of the permanent right-of-way during operations occur outside of the state-specific migratory bird TOYRs (see table 4.5.3-2), which Atlantic and DETI would implement. Thus, most direct impacts on migratory birds would be avoided.

Atlantic has applied for bald eagle nest disturbance permits for potential disturbance of Nest IDs BAEA-ACT-01, BAEA-ACT-05, and BAEA-ACT-06. Atlantic would not construct within the 660-foot nest buffer around Nest IDs BAEA-ACT-01 or BAEA-ACT-06 when the nests are active from approximately December 15 through July 15. If Atlantic identifies additional bald eagle nests or occupied bald or golden eagle winter roosting habitat prior to or during construction, Atlantic and DETI would follow the National Bald Eagle Management Guidelines. Bald eagle nests identified during aerial survey or the Center for Conservation Biology (CCB) database would be monitored during preconstruction to determine bird activity. Atlantic would also monitor for golden eagles ahead of winter vegetation clearing activities using a qualified Biological Monitor. Refer to the *Migratory Bird Plan* for additional information on bald and golden eagle monitoring.

Atlantic and DETI identified several raptor stick nests during the 2015 and 2016 surveys that are located within the construction workspace; however, most nests identified were not active. To avoid impacts on any potential nesting raptors that are not acclimated to similar activities, Atlantic and DETI would either remove the tree with the nest before it becomes active, or avoid active nests by employing an appropriate no-activity buffer during the nesting season in accordance with federal and state regulations (see table 3.1.1-1 in the *Migratory Bird Plan*). A qualified Biological Monitor would confirm nest inactivity prior to tree removal.

Based on desktop reviews and 2015 and 2016 aerial surveys, 15 rookeries were identified within the 0.5-mile disturbance buffer including 8 rookeries that were identified as needing agency coordination, and 7 rookeries that Atlantic recommended no restrictions based on surrounding land use and proximity to the right-of-way (including three rookeries that were observed as not being active during 2016 surveys). Within the 500-foot vegetation buffer, two rookeries were identified as needing agency coordination, and one rookery was observed as not being active during 2016 surveys. The three rookeries observed as not being active in 2016 were initially identified during the review of CCB and NHI data (see table 3.1.1-1 of the *Migratory Bird Plan* [see table 2.3.1-1]).

Atlantic conducted pedestrian surveys in February 2017 in West Virginia, Virginia, and North Carolina to investigate bird activity at the rookeries identified in previous desktop reviews and aerial surveys. Results of the pedestrian surveys and Atlantic's proposed conservation measures were submitted to the WVDNR, VDGIF, and NCWRC in letters dated April 12, 2017. To date, the WVDNR, VDGIF, and NRWRC have not commented on Atlantic's proposed conservation measures. Therefore, **we recommend that**:

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, a revised *Migratory Bird Plan* that incorporates the results of consultation with the WVDNR, VDGIF, and NCWRC, and verify that no additional conservation measures would be required to minimize impacts on active rookeries. In addition, table A-1 of the revised plan should incorporate the NCWRC's recommended updates to the North Carolina BCC list. The revised plan should also include the Virginia Piedmont Forest Block Complex, Allegheny Mountains Forest Block Complex, and the Southern Allegheny Plateau Forest Block Complex IBAs that would be crossed by ACP and SHP in Virginia and West Virginia.**

As described in section 2.1.2.6, Atlantic has proposed to upgrade existing and build 15 additional communication towers associated with ACP. We received comments from the VDCR and NCWRC regarding potential impacts of the proposed communication towers on migratory birds. Migratory birds are known to collide with towers during migration and can become confused or disoriented by lighting, or fly directly into the tower during nighttime migrations. Birds may also use the towers to build nests or as perches, and can be impacted by tower maintenance activities. As outlined in the *Migratory Bird Plan* (table 2.3.1-1), Atlantic would adhere to the FWS guidance for "Project Design and Maintenance" reviews of communication towers provided by the Raleigh FWS Office (FWS, 2013c) and the FWS Migratory Bird Office (FWS, 2016o), which includes:

- New towers would be placed in existing project workspace to minimize additional impacts on habitat.
- Guy wires would not be used for new tower and construction support; new towers would be self-supporting lattice structures.

- If a new tower is more than 199 feet tall, low intensity lighting would be used to meet Federal Aviation Administration (FAA) requirements. All towers greater than 199 feet tall would have aviation lighting per FAA requirements. Only white or red strobe lights would be used at night, and these would be the minimum number, minimum intensity, and minimum number of flashes per minute allowable by the FAA.
- New towers would be located more than 2,500 feet from a known active wood stork or other wading bird rookery.
- Security lighting for associated facilities, equipment, and infrastructure would be motion- or heat-sensitive, down-shielded, and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe nighttime access to the site.
- The *Invasive Plant Species Management Plan* would be applied to communication towers.
- If a migratory bird nest (e.g., osprey or bald eagle) is identified on the tower, maintenance activities would not occur during the active nesting period, unless the maintenance activities are critical. Atlantic and DETI would consult the regional FWS office if activities must occur when a nest on a tower is active to minimize impacts on the bird.
- Any routine vegetation clearing activities would adhere to the same restriction periods as pipeline right-of-way operational maintenance activities (i.e., outside the migratory bird season).

Atlantic and DETI would comply with the FERC and FWS MOU on migratory birds by implementing avoidance and minimization measures developed in consultation with the FWS and state natural resource agencies and focusing on species of concern. FWS field offices provided recommendations to Atlantic and DETI regarding migratory bird avoidance and minimization measures that Atlantic and DETI would implement. Atlantic and DETI would implement project-level and avian-specific measures during planning, construction, and operations and maintenance phases of ACP and SHP. Mitigation measures recommended by the agencies and additional details on the mitigation measures that Atlantic and DETI would adopt are found in section 5.0 of the *Migratory Bird Plan* (see table 2.3.1-1).

4.5.4 Game Species

Game species would be subject to temporary displacement and habitat loss until restoration is complete and native vegetation is reestablished. However, if adjacent habitats are at or near carrying capacity, displacement of or stress on game species could cause reduction in wildlife populations. Permanent habitat impacts would occur where the pipeline rights-of-way are maintained, aboveground facilities are constructed, and where fragmentation occurs. In most instances, suitable adjacent habitat would be available for wildlife species until grasses and woody vegetation are reestablished. Forage vegetation would be expected to recolonize quickly. Following construction, game species would be expected use the newly established right-of-way for foraging and travel. Restored pipeline rights-of-way generally provide an opportunity for developing high-quality feeding areas for game species, especially if non-native invasive species are controlled and native forage is seeded. Construction activities that coincide with hunting seasons (which vary in the project areas depending on species and location) may impact the hunters' experience and success in the project area by temporarily restricting access to hunting areas and temporarily affecting the spatial distribution of game species. Construction-related disturbance likely would displace game species from adjacent habitats. In general, game species would be expected to return to vacated habitats after construction and restoration efforts are completed, and success rates would likely be similar to preconstruction success rates.

The new pipeline right-of-way could increase access to remote or previously inaccessible hunting areas, which could result in increased hunting success. In addition, game species that use a cleared right-of-way could be more likely harvested. Increased public recreation along cleared rights-of-way in the hunting season, especially near crossings of existing access points, has been documented elsewhere (Crabtree, 1984). Increased public access along the new pipeline right-of-way could increase poaching of game and non-game wildlife. This impact would be greater on smaller game species because they typically have smaller home ranges and movement areas than larger species and could experience greater population impacts from habitat loss and fragmentation.

Hunting and trapping are common activities in ACP and SHP project areas. Game species such as the mourning dove, ruffed grouse, wild turkey, Canada goose, woodcock, quail, pheasant, and a variety of waterfowl are recreationally hunted. Mammal species such as black bear, white-tailed deer, rabbit, squirrel, raccoon, bobcat, fox, coyote, and beaver have hunting and/or trapping seasons. A list of game species by state/commonwealth is included in table 4.5.4-1.

TABLE 4.5.4-1

Game Species by State/Commonwealth for the Atlantic Coast Pipeline and Supply Header Project

State	Game Species
Pennsylvania	Red, gray, black, and fox squirrels; ruffed grouse; rabbit; cottontail; pheasant; bobwhite quail; hares; woodchuck; porcupine; crow; starling; English sparrow; wild turkey; black bear; elk; white-tailed deer; coyote; raccoon; fox; opossum; striped skunk; weasel; bobcat; mink; muskrat; beaver; fisher; river otter; waterfowl and migratory birds (varies)
West Virginia	Ruffed grouse; white-tailed deer; wild turkey; migratory birds (varies); black bear; gray, black, albino, and fox squirrels; bobwhite quail; rabbit; hare; pheasant; raccoon; red and gray fox; bobcat; mike; muskrat; fisher; beaver; otter; crow; coyote; skunk; opossum; woodchuck; weasel; English sparrow; starling; pigeon; waterfowl (varies)
Virginia	Black bear; white-tailed deer; elk; turkey; crow; groundhog; grouse; quail; pheasant; rabbit; squirrel; dove; woodcock; snipe; rail; goose; teal; other waterfowl (varies); bobcat; coyote; fox; opossum; skunk; raccoon
North Carolina	Black bear; white-tailed deer; wild turkey; armadillo; beaver; bobcat; coyote; crow; feral swine; gray and red fox; groundhog; grouse; nutria; opossum; pheasant; quail; rabbit; raccoon; skunk; squirrel; waterfowl and migratory birds (varies)

4.5.5 General Impacts and Mitigation on Wildlife Resources and Habitat

Pipeline construction would have direct and indirect, and short-term to permanent impacts on wildlife resources. As defined in section 4, short-term impacts generally require the resource to return to preconstruction conditions within 3 years following construction. Long-term impacts require anywhere from 3 to 50 years to return to preconstruction conditions. Permanent impacts would occur when preconstruction conditions are not restored within 50 years. Direct impacts on wildlife habitat, whether by vegetation removal, conversion of one habitat type to another, alteration of key components, or degradation due to proximity of disturbances, also indirectly affect wildlife populations. Indirect impacts on wildlife are often subtle and difficult to document. The severity of impacts would depend on factors such as the sensitivity of the species impacted; seasonal use patterns, type, and timing of construction and operation activities; and physical parameters (e.g., topography, cover, forage, climate). It is important to note that the impacts described in this section, except where noted, apply to more common wildlife species and habitat found in the ACP and SHP project areas. Potential impacts on more sensitive wildlife resources, including ESA-listed, proposed, and under review species, FS-managed species, and state-listed and sensitive species are discussed in section 4.7.

Construction of ACP and SHP facilities would affect 7,508.9 acres of wildlife habitat (see table 4.4.3-1 and appendix Q). About 2,745.0 acres of forested habitat (upland) and 392.9 acres of woody wetland habitat would be permanently converted and maintained in an early successional stage by mowing and periodic tree removal during operations. As discussed in more detail in sections 4.5.3 and 4.7, TOYR for tree clearing would minimize impacts on species such as nesting migratory birds and roosting bats.

The impact of the ACP and SHP on wildlife species and their habitats would vary depending on the habitat requirements of each species and the existing habitat present within the project area. Direct impacts from construction would include the displacement of wildlife and direct mortality of some individuals, such as incubating birds, their eggs, and nestlings; small mammals; invertebrates, including their eggs and larvae; and slow-moving reptiles and amphibians, including their eggs. Larger or more mobile wildlife, such as adult bats, birds, and large mammals, would leave the vicinity of the right-of-way as construction activities approach. The influx and increased density of animals in nearby undisturbed areas could also reduce the reproductive success of animals that are not displaced by construction, and increase the risk of predation in the area. These effects would diminish after construction, and some wildlife could return to the newly disturbed areas and adjacent, undisturbed habitats after right-of-way restoration is completed and access roads are restored or their use is no longer required. Wildlife populations of some species would return to preconstruction levels only when and if suitable habitat is restored. As described in section 4.5.1, destruction of certain habitat types, such as rocky outcrops or vernal pools, which serve as habitat for species with more limited mobility and range, or where a species exhibits high site fidelity would be permanently altered, degraded or destroyed, and may permanently displace some wildlife species. Displacement of these individuals could result in decreased fitness and possible mortality.

The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available cover, nesting, and foraging habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction. Herbaceous habitats would be restored to a structural condition similar to preconstruction in a relatively short time (i.e., 3 to 5 years). This would be facilitated by reseeding or replanting disturbed areas with native seeds, seedlings, and transplants, and by adequately minimizing the disturbance to the existing topsoil in the construction right-of-way. Forested and scrub/shrub habitat, however, could take up to 50 years or longer to recover. Although the structural component of forested- and shrub-dominated habitats would recover slowly, successful restoration of non-woody vegetation may improve the forage value for some wildlife species within a relatively short time. Those terrestrial wildlife species not indicated as federally listed, proposed, or under review for listing under the ESA, FS-managed species, or state-listed or Species of Greatest Conservation Need (SGCN) (see section 4.7) appear to be locally abundant and have stable population levels.

Most adequately-mobile wildlife that would be displaced by construction would likely relocate to similar adjacent habitats; however, some individuals may not be able to relocate to suitable habitat due to a lack of adequate territorial space, or inter- and intra-specific competition, which could result in lower reproductive success, and lower survival success. Impacts on habitat would generally be short-term for species that utilize herbaceous habitats and long-term to permanent for species that utilize scrub-shrub or forested habitats, as restoration of forested areas would require a greater amount of time, generally at least several decades. Fragmentation of forested habitat would make the right-of-way permanently unsuitable for interior forest species, but may create new habitat for species that prefer ecological edges. The fragmentation and edge effects of maintaining the pipeline rights-of-way are further discussed in section 4.5.6. Upon successful restoration, wildlife would be expected to return and colonize herbaceous and agricultural habitats that were affected by construction and restored back to their preconstruction condition.

Constructing the projects may result in mortality of displaced animals, particularly less mobile animals such as small mammals, incubating and nestling birds, reptiles, amphibians, and invertebrates which may be unable to escape the immediate construction area; and disruption of bird courting, breeding, or nesting behaviors on and adjacent to construction work areas. Destruction of vernal pools during construction is likely to be permanent, and due to the high degree of site fidelity to breeding locations that amphibians have demonstrated, localized extinctions may occur. These impacts would primarily occur during construction, but may also occur during restoration and routine maintenance.

During pipeline facility installation, there is potential for wildlife and/or livestock to be injured or killed by falling into or being trapped in the open trench. Atlantic and DETI would work with landowners to move livestock to alternate fields during construction or maintain adequate temporary fencing in grazing areas. If cattle or other livestock are present during construction, Atlantic and DETI would install temporary fencing around the right-of-way in areas where the pipe trench must be left open overnight. Additionally, temporary soft plugs and ramps would be installed in the trench to provide passage across or egress from the open trench. Atlantic's and DETI's EIs would inspect the open trench daily, prior to construction, to identify and relocate animals (or livestock) that may have fallen into the trench. Atlantic and DETI would also place gaps in the temporary trench spoil piles and pipe stringing areas to allow wildlife movement through the construction corridor.

Hunting areas crossed and near to the project area may be temporarily unusable during construction and restoration periods should activities occur during a hunting season for a species. Section 4.8.5 addresses concerns from the public regarding fishing and hunting impacts, and the measures that would be implemented to minimize these recreational opportunities.

Construction of aboveground compressor stations, M&R stations, and pig launchers/receivers would permanently impact 86.7 acres of wildlife habitat; this habitat would not be allowed to regenerate after construction (see table 4.4.3-1). The proposed contractor yards would temporarily impact 141.6 acres (see table 4.4.3-1). Following construction, Atlantic and DETI would restore and reseed any previously vegetated areas that are affected, except for actively cultivated croplands, unless approved in writing by the landowner. Use of these areas would temporarily displace wildlife species; however, displaced wildlife would return to these areas following restoration. Therefore, no permanent impacts on wildlife would result from the use of the contractor yards.

Approximately 91 percent of proposed access roads (based on construction land requirements; see table 2.2-1) identified in appendix E are existing roads (private and/or public), 5 percent would be newly constructed roads, and approximately 4 percent would be existing roads requiring an extension(s). Construction of new roads, upgrades to existing roads, and use of these roads for construction could disturb wildlife near the road. New roads left in place after construction may increase human activity in these areas. In addition, roads left in place could be used as travel corridors into forests by predators such as foxes, skunks, and raccoons (Askins, 2000). Wildlife such as deer, small mammals, and birds may avoid the area due to the temporary increase in human activity (Trombulak and Frissell, 2000).

4.5.6 Interior Forest Habitat Fragmentation and Edge Effects

Constructing ACP and SHP would create a new, cleared corridor through forested lands. When practical, the projects would be collocated with previously cleared and maintained corridors. However, in numerous locations the projects would not be collocated with an existing corridor, resulting in the fragmentation of interior forested lands. The following discussion is based largely on two comprehensive literature reviews that summarize the results of numerous studies on habitat fragmentation and related edge effects on native flora and fauna, and the variables and thresholds that cause negative impacts to occur within forest ecosystems: Environment Canada's *How Much Habitat is Enough?* (2013), and Haddad et al.'s *Habitat fragmentation and its lasting impact on Earth's ecosystems* (2015). Haddad et al. (2015) summarizes the results of fragmentation experiments over the last 35 years on five different continents and various ecosystems.

Studies have suggested that for forest-dependent wildlife, overall forest cover is one of the most important metrics in determining long-term species persistence. Although the amount of forest cover requirements vary for forest-dwelling species, studies indicate that most forest-dwelling eastern North American birds require more than 30 percent cover, while more sensitive forest bird species require at least 40 percent forest cover to maintain healthy population levels. Due to the small home range and limited mobility of amphibian species, impacts on local forest cover (up to 1 kilometer) can affect species abundance and diversity. At these local levels, forest cover between 50 and 60 percent are necessary to maintain healthy levels of species diversity and abundance. In some species, the proximity to breeding ponds is as important as forest cover (Environment Canada, 2013). ACP and SHP would not be expected to contribute to a significant reduction in the overall amount of forest cover available on a regional level; however, localized impacts on wildlife could be more significant depending on the species.

Fragmentation can be described as the breaking up of contiguous vegetation into smaller patches. Fragmentation and a loss of habitat connectivity could also impact wildlife. Where forest cover is extensive and well-connected, forest patches (small fragment areas) can be recolonized by individuals from adjacent patches; however, as the overall amount of available habitat and connectivity between those habitats decline, recolonization also declines, increasing chances of extirpation (Environment Canada, 2013; Haddad et al., 2015). The removal of interior forest to create the rights-of-way would result in the conversion of forest to herbaceous and/or scrub-shrub vegetation and would remove habitat for interior species. Species that require large tracts of unbroken forest land would need to seek suitable habitat elsewhere. As discussed above, overall forest cover is the most important factor in determining long-term persistence of forest species; however, as fragmentation of habitat increases, the configuration of the remaining habitat patches becomes more important in supporting the remaining species in the landscape. This becomes increasingly important for species of more limited mobility and home ranges (e.g., amphibians, small mammals). Although small patches can provide habitat for some species, the preservation of larger patches is necessary for the long-term survival of forest populations. Larger forest patches have greater diversity of habitat niches and area, and therefore can support greater species diversity. In a study of four forest breeding birds (ovenbird, wood thrush, veery, and rose-breasted grosbeak), results suggested that maintenance of "cores" of at least 127 to approximately 300 hectares (ha) is necessary to maintain source populations of forest breeding birds in the adjacent fragmented landscape. Generally, the data support that for forest birds, 200 ha will support approximately 80 percent of area-sensitive species (Environment Canada, 2013).

Linear or irregularly shaped forest patches in fragmented landscapes tend to be colonized more frequently and more extensively by predators, more vulnerable to invasive species, and subject to lower rates of reproduction and more wildlife species emigration. The distance between forest patches is also a factor in long-term sustainability of species; for certain forest birds, successful recolonization of patches generally occurs at distances between 1 and 5 kilometers. However, for interior-dependent bird species (e.g., scarlet tanager), as the number of fragmented patches increases, recolonization may decrease. Distance between patches for successful recolonization of amphibians vary from 1,000 meters to up to 10 kilometers from breeding pools (Environment Canada, 2013).

This removal of forest interior creates "edge habitat," which is different from the interior habitat cores and supports different numbers and ranges of species. Forest edges play a crucial role in ecosystem interactions and landscape function, including the distribution of plants and animals, fire spread, vegetation structure, and wildlife habitat. Creation of new forest edge along dense canopy forests could impact interior forest microclimate factors such as wind, humidity, and light and could lead to a change in vegetation species composition within the adjacent forest or increase the spread of invasive species. Vegetation along forest edges receive more direct solar radiation during the day, lose more long-wave radiation at night, have lower humidity, and receive less short-wave radiation than areas in the forest interior. Increased solar radiation and wind could desiccate vegetation by increasing evapotranspiration, affect which species survive along the edge (typically favoring shade intolerant species), and impact soil characteristics. Corridors and forest edges are also common vectors for the introduction and spread of non-native invasive plant species, since many of them are shade-intolerant and grow at a faster rate than other native species. Edge effects could include a change in available habitat for some species due to the introduction of non-native invasive plant species, and an increase in light and temperature levels on the forest floor and the subsequent reduction in soil moisture; such changes may result in habitat that would no longer be suitable for species that require these specific habitat conditions (Harper et al., 2005; Haddad et al., 2015). The extent of edge effects can vary depending on the stressor being discussed; however, scientific and technical studies typically use 100 meters (or 300 feet) from the forest edge to measure where the "edge effect" tapers off and the undisturbed core habitat begins (Environment Canada, 2013).

Increased avian predation (e.g., brown-headed cowbirds, snakes) has been well documented in forest edges and could contribute to reduced breeding success in these areas. Response of interior forest bird species to edges is conflicting; it appears that responses to edge may depend on other factors such as overall forest cover, density of the species within the patch, and the characteristics of the habitat patch. Smaller less mobile species such as invertebrates, amphibians, reptiles, and some small mammals could experience greater impacts from the creation of edges, which can act as a barrier to movement; some of these species tend to be more averse to crossing wide corridors due to lack of cover and increased risk of predation. Creation of a permanently maintained herbaceous and shrub-scrub open corridor would also create new movement corridors for many wildlife species, such as white tailed-deer that may use the corridor edge to browse. Predator species, such as coyote and red fox, also tend to travel along open corridors in search of prey, thus increasing the opportunity and likelihood of predation on species in adjacent patches of habitat (Environment Canada, 2013).

Studies continue to support that it is an interaction between forest cover, fragmentation, isolation, and edge effect that determines the suitability and long-term persistence of species. Even with low forest cover in one patch, the proximity of large forest cores containing over 30 percent coverage can support the smaller patches (Environment Canada, 2013). However, further reduction in fragment area, increased fragment isolation, and increased proportion of edge habitat have been consistently shown to degrade ecosystems and reduce species persistence, species richness, nutrient retention, trophic dynamics, and, in more isolated fragments, movement (Haddad et al., 2015). It is also important to note that these studies provide data from a variety of development types, including urbanization, residential (housing) developments, highways and roads, railroads, and utility corridors, and the magnitude of impacts from these different development types vary.

We received numerous comments on the draft EIS, including comments from the FWS, FS, WVDNR, VDEQ, and NCWRC, expressing concern regarding forest fragmentation and the impacts on interior forest and their associated wildlife species. Based on our recommendations in the draft EIS and comments received, Atlantic and DETI revised their forest fragmentation analysis. The analysis below utilizes West Virginia state forest block data produced by the Natural Resource Analysis Center (NRAC) at West Virginia University, the VDCR-NHP Virginia Natural Landscape Assessment (VaNLA) project to assess forest fragmentation impacts in West Virginia and Virginia, respectively, and manual interpretation of interior forest blocks encompassing 35 or more acres using aerial photography for North Carolina. Atlantic identified 35 acres as the minimum size of interior forest habitat that would support most interior forest bird species (Robbins et al., 1989). Impacts on interior forest blocks are quantified in terms of direct loss of forest coverage and the acreage of new forest edge measured 300 feet from the edge of the workspace into the interior forest block, which could experience the edge effects described above (Environment Canada, 2013).

4.5.6.1 West Virginia

The West Virginia state forest fragmentation data categorize core forest areas as large core (greater than 500 acres); medium core (250 to 500 acres); and small core (less than 250 acres). It also categorizes the areas adjacent to core forest as perforated, edge, and patch. Perforated includes the boundaries between core forest and relatively small clearings within the forest; edge includes interior boundaries with relatively large clearings as well as the exterior boundaries of core forest regions; and patch is a small forested area that is disconnected to neighboring core forest areas (Strager and Maxwell, 2012 and Vogt, 2006). Edge habitat is considered to be 300-foot forested buffer from a corridor/disturbance with interior forest starting at the point beyond the 300-foot edge buffer.

ACP would cross 48 interior forest blocks (i.e., patch, and small, medium, and large cores) covering 2,316,722 acres in West Virginia. Direct impacts would result in the loss of 1,703 acres of interior forest habitat, including 543 acres from construction and 559 acres from operation of the pipeline (see table 4.5.6-1 and figures 4.5.6-1a and 4.5.6-1b). Edge and perforated habitat types were not included in these calculations because, per the definition provided above, these are open habitats between forest edges; therefore, the placement of the pipeline within these boundaries would not contribute to additional loss of forest coverage. In addition, construction of ACP in West Virginia would create 7,900 acres of new forest edge measured 300 feet from the edge of the workspace into the interior forest block. As noted in table 4.5.6-1, impacts would be most pronounced to the patch and small cores, causing further fragmentation and associated edge effects to greater than 10 percent of those block habitats crossed by ACP.

TABLE 4.5.6-1

Interior Forest Affected by the Atlantic Coast Pipeline in West Virginia

Category [a]	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Patch	23	449.2	10.5	4.9	15.4 (3%)	*185.1 (41%)*
Small Core	19	915.5	17.2	14.9	32.1 (4%)	*166.6 (18%)*
Medium Core	1	443.1	3.9	2.3	6.2 (1%)	18.8 (4%)
Large Core	5	2,314,914.1	511.6	537.3	1,048.9 (<1%)	7,529.6 (<1%)
Totals	**48**	**2,316,722**	**543.1**	**559.4**	**1,102.6 (<1%)**	**7,900.1 (<1%)**

[a] Patch = small forested area disconnected from neighboring core forest areas; Small Core = less than 250 acres; Medium Core = 250 to 500 acres; Large Core = more than 500 acres.
Source: West Virginia state forest block data produced by the NRAC at West Virginia University.

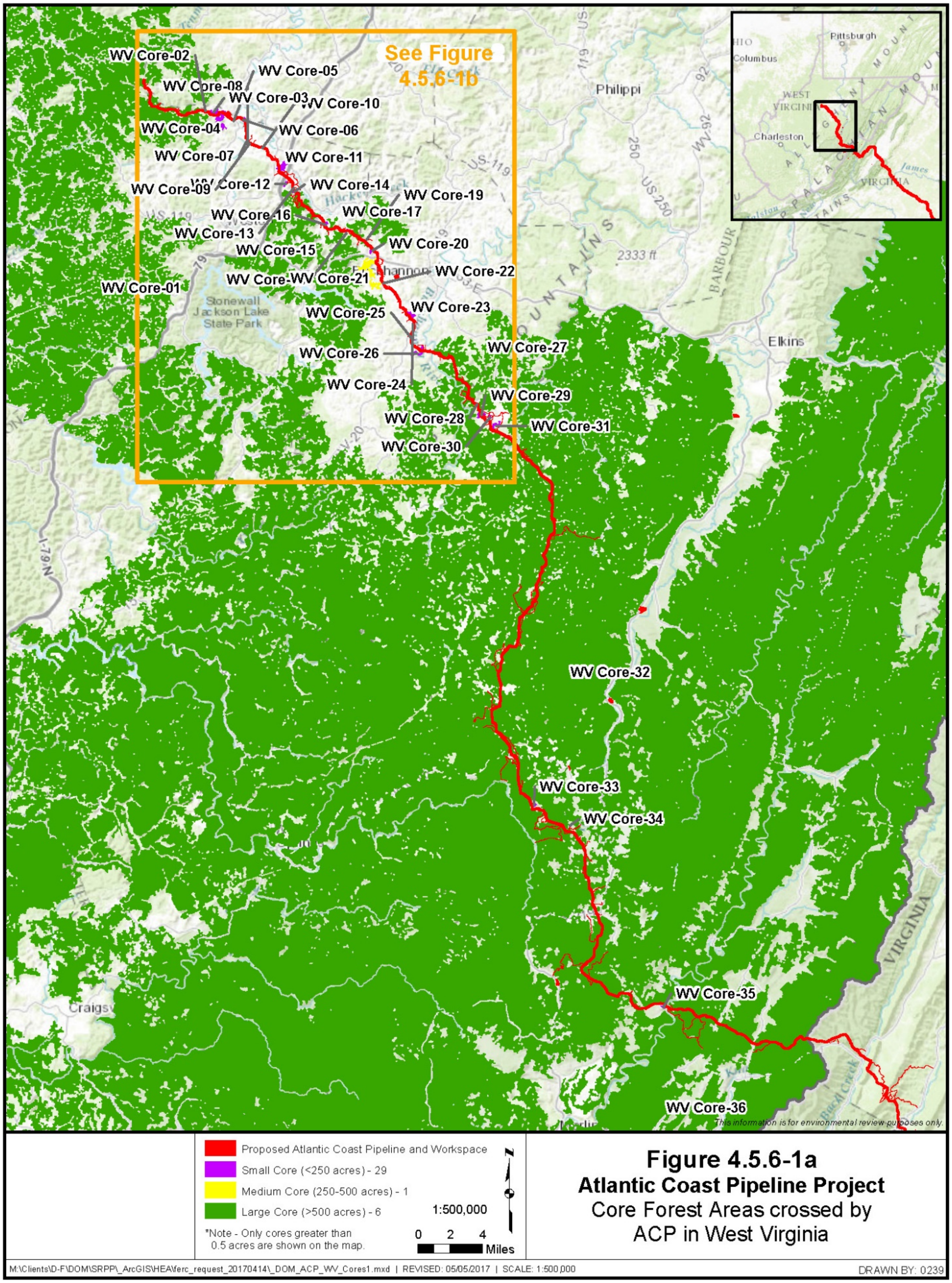
SHP would cross six interior forest cores covering 539,828 acres in West Virginia. Direct impacts would result in the loss of 390 acres of interior forest habitat, including 198 acres from construction and 192 acres from operation of the pipeline (see table 4.5.6-2 and figure 4.5.6-2). Edge and perforated habitat types were not included in these calculations because, per the definition provided above, these are open habitats between forest edges; therefore, the placement of the pipeline within these boundaries would not contribute to additional loss of forest coverage. In addition, construction of SHP in West Virginia would create 2,465 acres of new forest edge. As noted in table 4.5.6-2, impacts would be most pronounced on patch habitats, causing further fragmentation and associated edge effects to these already fragmented blocks.

TABLE 4.5.6-2

Interior Forest Affected by the Supply Header Pipeline Project in West Virginia

Category [a]	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Patch	3	36.1	1.5	1.8	3.3 (9%)	*19.1 (53%)*
Small Core	0	22.0	0.0	0.0	0.0 (0%)	1.6 (7%)
Large Core	3	539,770.2	196.5	189.9	386.4 (<1%)	2,444.1 (<1%)
Totals	**6**	**539,828.3**	**198.1**	**191.8**	**389.7 (<1%)**	**2,464.8 (<1%)**

[a] Patch = small forested area disconnected from neighboring core forest areas; Small Core = less than 250 acres; Medium Core = 250 to 500 acres; Large Core = more than 500 acres.
Source: West Virginia state forest block data produced by the NRAC at West Virginia University.


See Figure 4.5.6-1b
WV Core-01
WV Core-02
WV Core-03
WV Core-04
WV Core-05
WV Core-06
WV Core-07
WV Core-08
WV Core-09
WV Core-10
WV Core-11
WV Core-12
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WV Core-33
WV Core-34
WV Core-35
WV Core-36
Philippi
Elkins
Stonewall Jackson Lake State Park
2333 ft
Pittsburgh
Columbus
Charleston
WEST VIRGINIA
VIRGINIA
This information is for environmental review purposes only
Proposed Atlantic Coast Pipeline and Workspace
Small Core (<250 acres) - 29
Medium Core (250-500 acres) - 1
Large Core (>500 acres) - 6
*Note - Only cores greater than 0.5 acres are shown on the map.
1:500,000
0 2 4 Miles
Figure 4.5.6-1a
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in West Virginia
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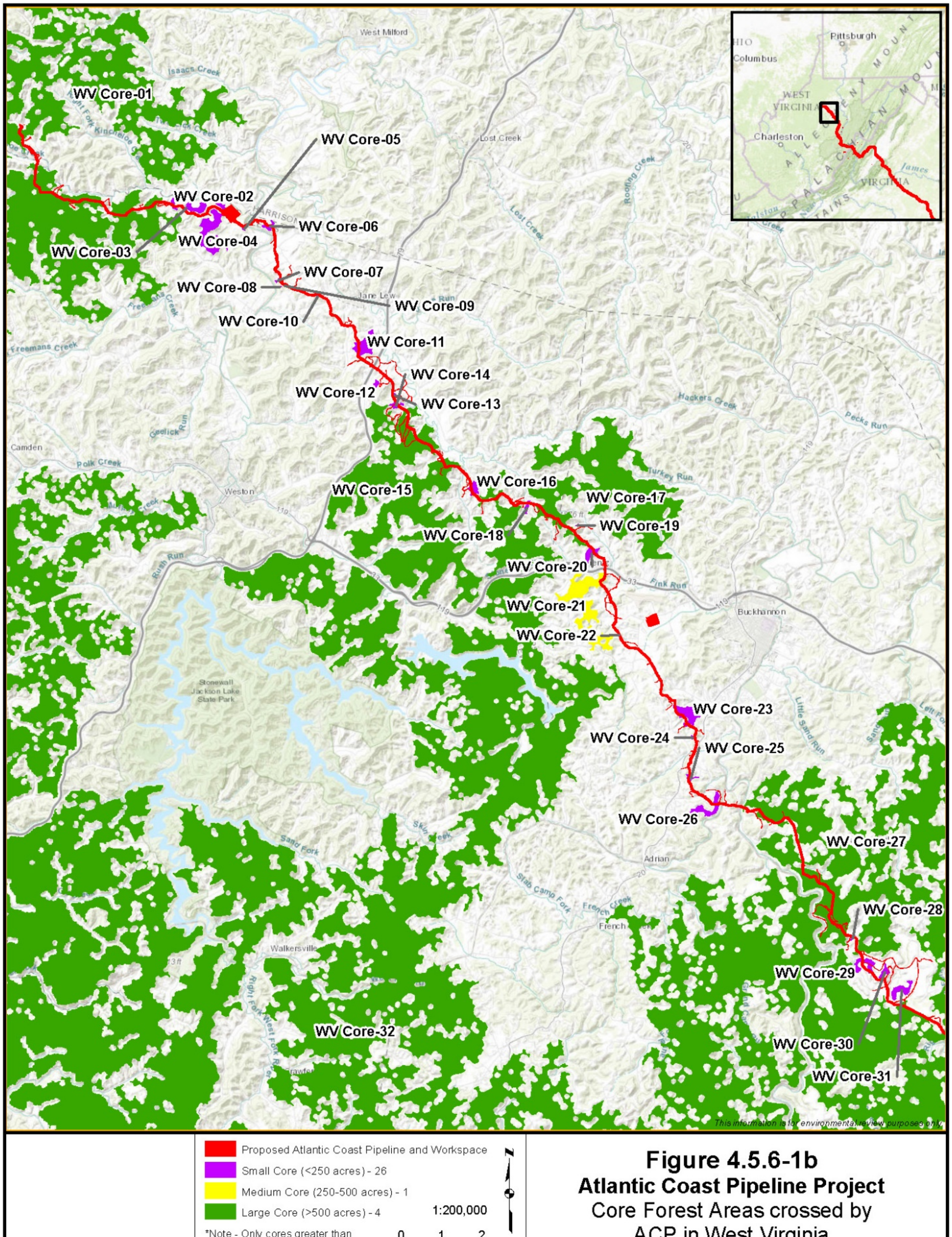

Figure 4.5.6-1b
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in West Virginia

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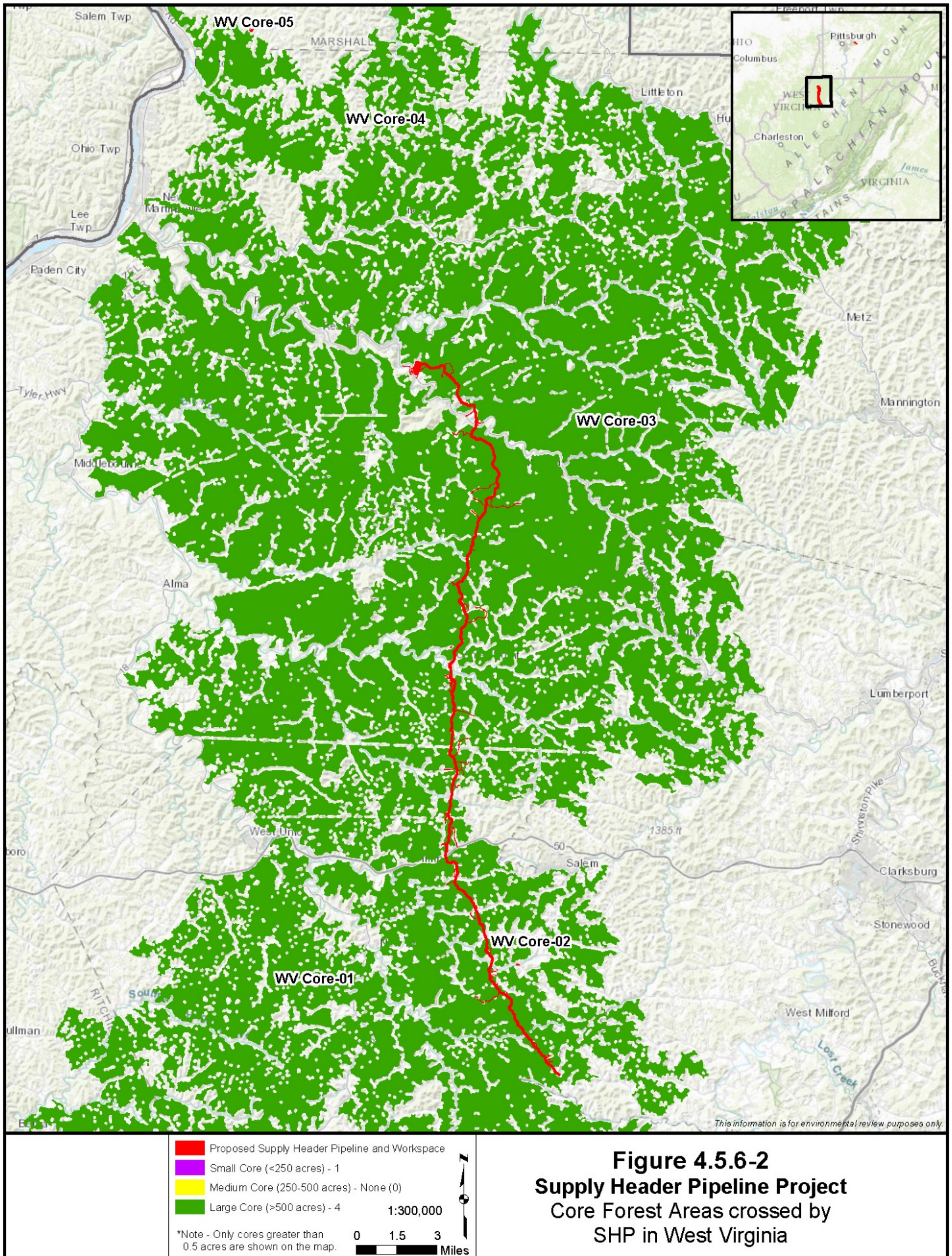


Figure 4.5.6-2
Supply Header Pipeline Project
Core Forest Areas crossed by
SHP in West Virginia

4.5.6.2 Virginia

The VaNLA (2007) collectively categorizes land with a minimum of 100 acres of interior forest cover and associated habitat fragments that provide connectivity between habitat patches as ecological cores. Each core and habitat fragment has been assigned an Ecological Integrity Score that rates the relative contribution of that area to the ecosystem service values. In general, larger, more biologically diverse areas are given higher scores. Scores are enhanced if the core or habitat fragment is part of a larger complex of natural lands. Scores also are increased for those cores and habitat fragments that contribute to water quality enhancement. The categories are Outstanding; Very High; High; Moderate; and General (VDCR, 2017d).

In Virginia, ACP would cross 187 ecological cores, including 37 categorized as Outstanding, Very High, or High. Direct impacts would result in the loss of 3,062 acres of interior forest habitat, including 1,739 acres from construction and 1,323 acres from operation of the pipeline (see table 4.5.6-3 and figure 4.5.6-3). In addition, construction of ACP in Virginia would create 17,436 acres of new forest edge. As noted in table 4.5.6-3, impacts would be greatest on the moderate and general ecological core types, causing further fragmentation and associated edge effects to those block habitats crossed by ACP.

TABLE 4.5.6-3

Interior Forest Areas Affected by the Atlantic Coast Pipeline in Virginia

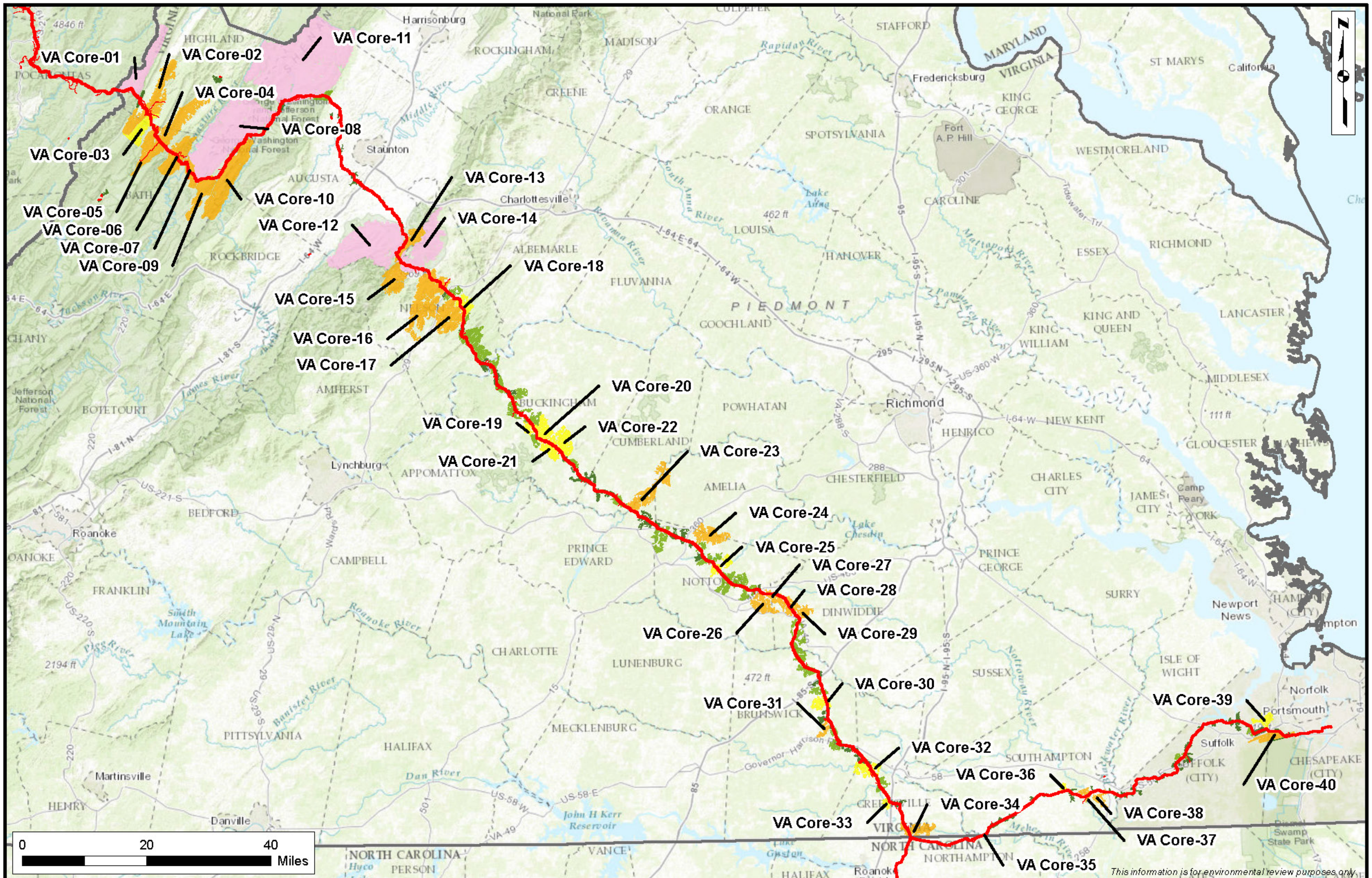
Category	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Outstanding	5	337,930.6	178.2	134.5	312.7 (<1%)	1,750.1 (1%)
Very High	20	195,971.3	419.4	358.9	778.3 (<1%)	4,876.0 (2%)
High	12	48,542.0	177.2	124.1	301.3 (1%)	1,644.0 (3%)
Moderate	37	75,050.3	484.8	319.6	804.4 (1%)	4,096.8 (5%)
General	113	54,537.3	479.7	386.0	865.7 (2%)	5,069.0 (9%)
Totals	**187**	**712,031.5**	**1,739.3**	**1,323.1**	**3,062.4 (2%)**	**17,435.8 (3%)**

Source: VDCR-NHP VaNLA project.

4.5.6.3 North Carolina

Atlantic analyzed forest fragmentation in North Carolina by manually interpreting interior forest blocks encompassing 35 or more acres using aerial photography in a GIS. Atlantic classified small cores as less than 250 acres, medium cores as 250 to 500 acres, and large cores as 500 acres or greater.

The ACP would cross 122 core forest areas covering 27,129.1 acres in North Carolina. Direct impacts would result in the loss of 337 acres of interior forest habitat, including 155 acres from construction and 181 acres from operation of the pipeline (see table 4.5.6-4 and figure 4.5.6-5). In addition, construction of ACP in North Carolina would create 2,224 acres of new forest edge. As noted in table 4.5.6-4, impacts would be greatest on the small and medium core types, causing further fragmentation and associated edge effects to those block habitats crossed by ACP.



Ecological Core Area

- C1: Outstanding
- C2: Very High
- C3: High
- C4: Moderate
- C5: General

Proposed Route

Figure 4.5.6-3
Atlantic Coast Pipeline Project
Ecological Core Areas crossed by ACP in Virginia

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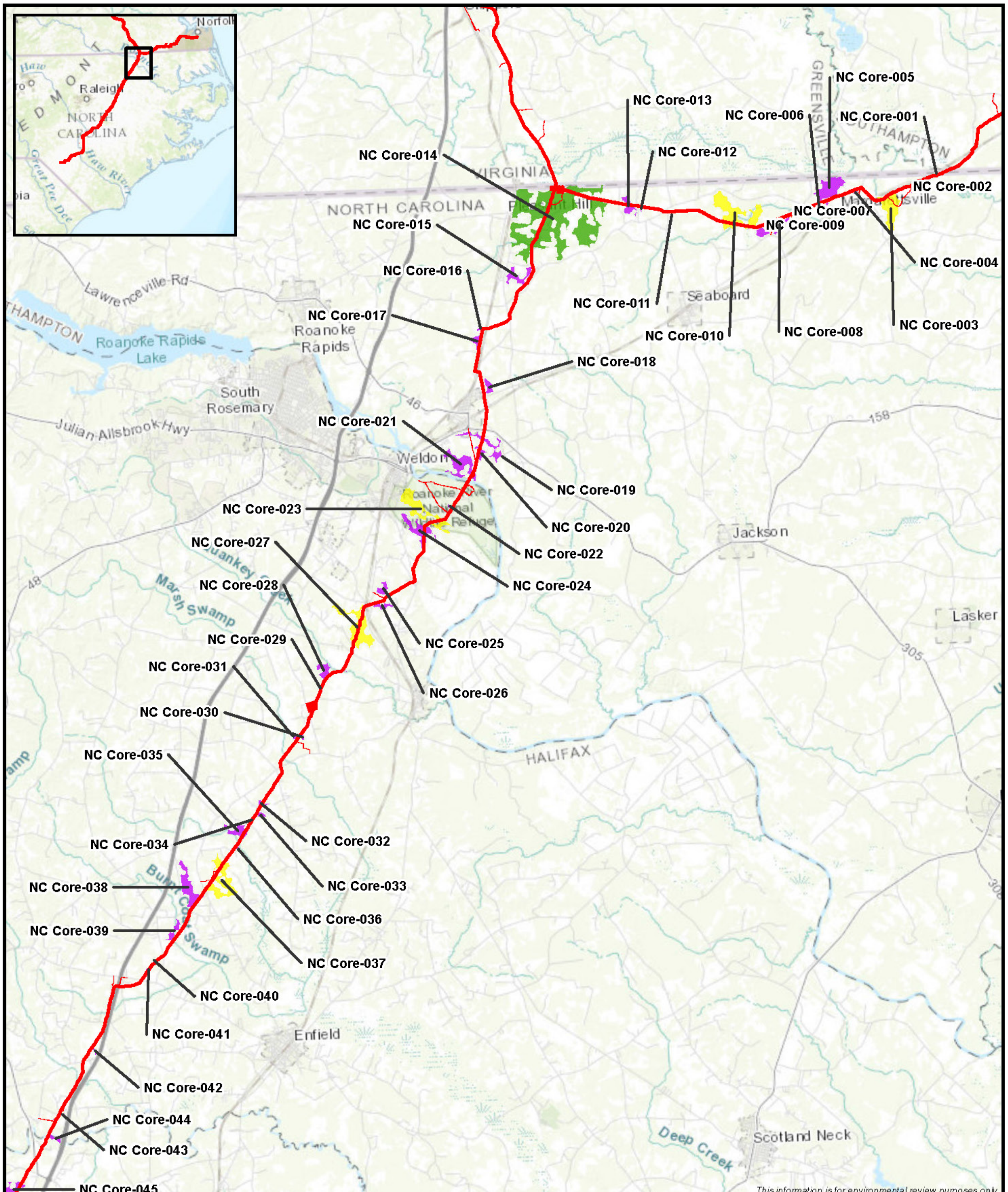

Proposed Atlantic Coast Pipeline and Workspace
Small Core (<250 acres)
Medium Core (250-500 acres)
Large Core (>500 acres)

*Note - Only cores greater than 0.5 acres are shown on the map.

1:253,440

0 2 4 Miles

Figure 4.5.6-4a
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in North Carolina

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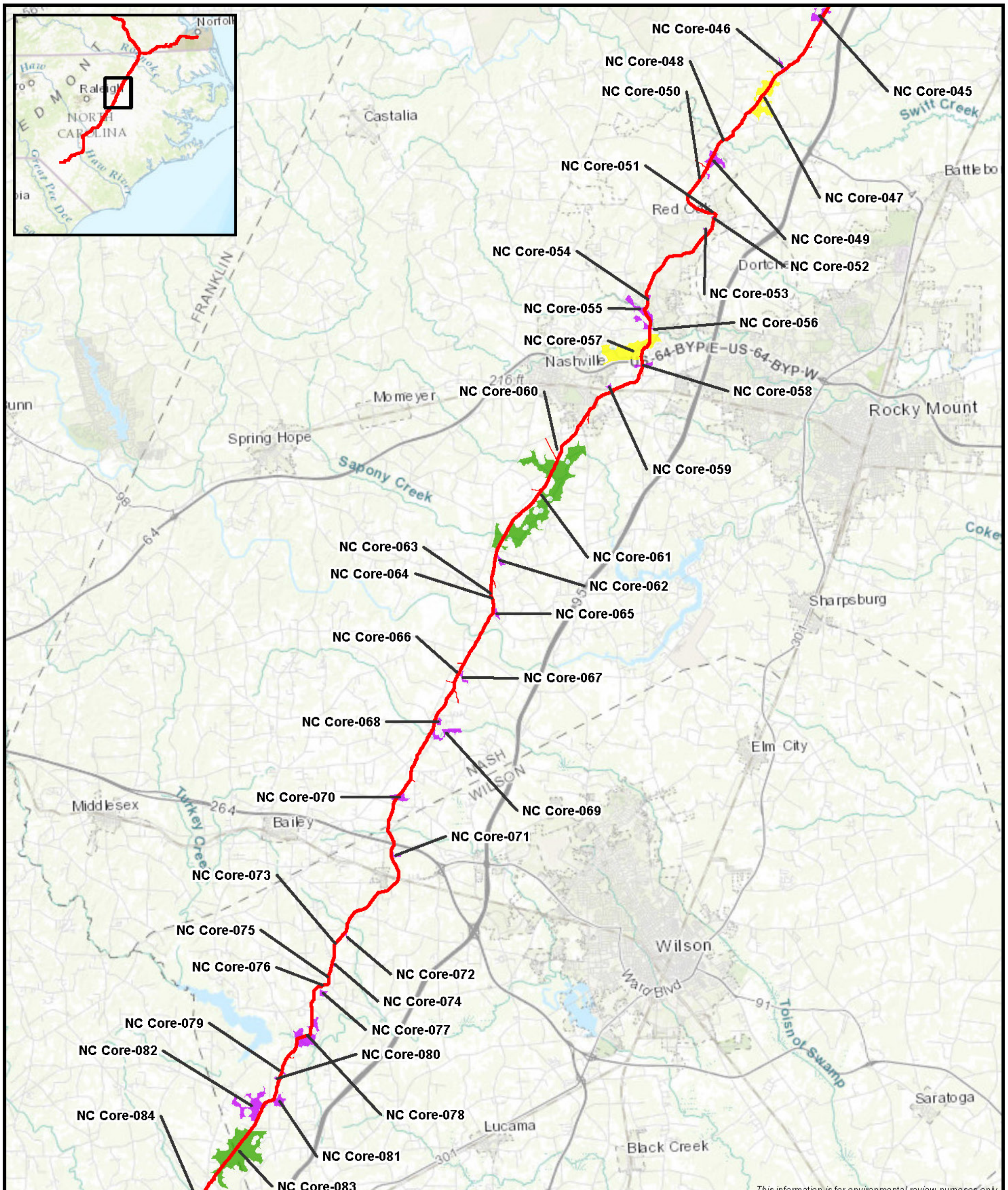

Proposed Atlantic Coast Pipeline and Workspace
Small Core (<250 acres)
Medium Core (250-500 acres)
Large Core (>500 acres)

*Note - Only cores greater than 0.5 acres are shown on the map.

1:253,440

0 2 4 Miles

Figure 4.5.6-4b
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in North Carolina

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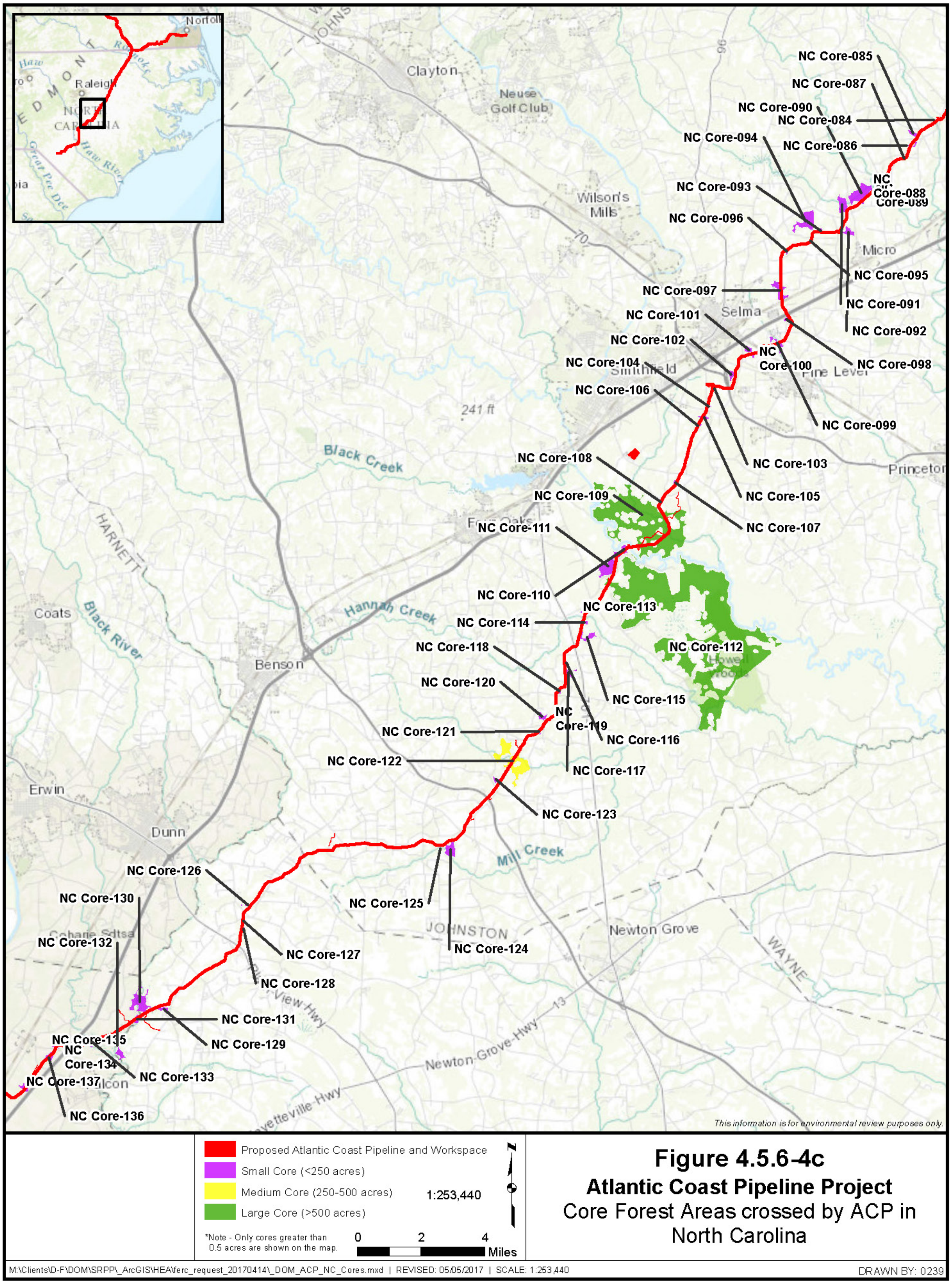
NC Core-085
NC Core-087
NC Core-090
NC Core-084
NC Core-094
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NC Core-095
NC Core-097
NC Core-091
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NC Core-128
NC Core-131
NC Core-135
NC Core-129
NC Core-134
NC Core-133
NC Core-137
NC Core-136
Clayton
Neuse Golf Club
Wilson's Mills
Micro
Selma
Smithfield
Pine Level
Princeton
241 ft
Black Creek
Four Oaks
Hannah Creek
HARNETT
Coats
Black River
Benson
Erwin
Dunn
Mill Creek
JOHNSTON
Newton Grove
WAYNE
Newton Grove Hwy
Fayetteville Hwy
Raleigh
NORTH CAROLINA
Norfolk
This information is for environmental review purposes only.
Proposed Atlantic Coast Pipeline and Workspace
Small Core (<250 acres)
Medium Core (250-500 acres)
Large Core (>500 acres)
*Note - Only cores greater than 0.5 acres are shown on the map.
1:253,440
0 2 4 Miles
Figure 4.5.6-4c
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in North Carolina
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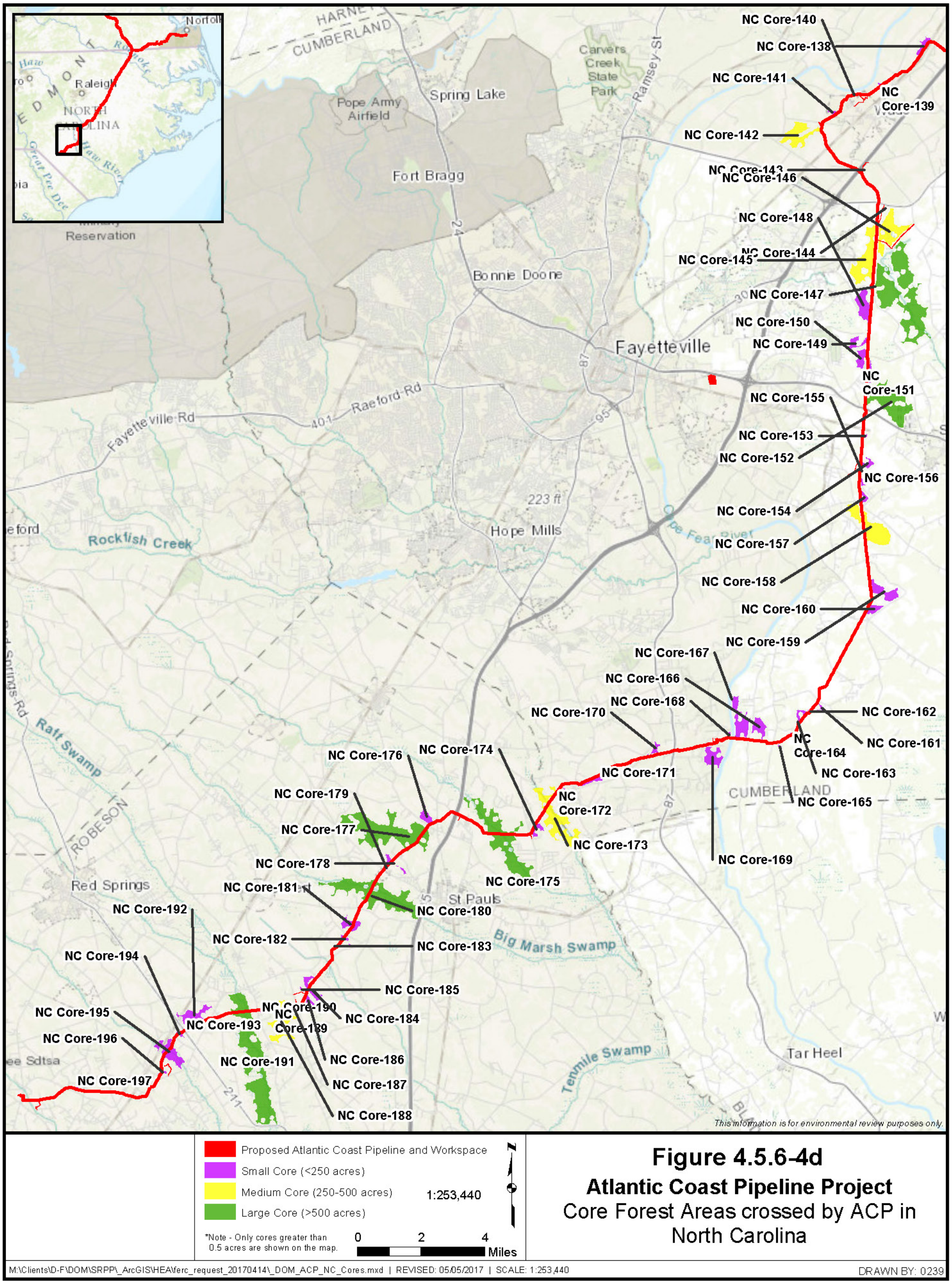

Figure 4.5.6-4d
Atlantic Coast Pipeline Project
Core Forest Areas crossed by ACP in North Carolina

TABLE 4.5.6-4

Interior Forest Affected by the Atlantic Coast Pipeline in North Carolina

Category [a]	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Small Core	102	6,471.4	69.1	74.1	143.2 (2%)	*974.5 (15%)*
Medium Core	11	4,752.8	30.6	34.7	65.3 (1%)	*472.0 (10%)*
Large Core	9	15,904.9	55.8	72.5	128.3 (1%)	777.4 (5%)
Totals	**122**	**27,129.1**	**155.5**	**181.3**	**336.8 (1%)**	**2,223.9 (8%)**

[a] Small Core = less than 250 acres; Medium Core = 250-500 acres; and Large Core = more than 500 acres.

Constructing and operating ACP and SHP pipeline facilities would result in the following impacts to interior forests:

1) Loss of interior forest habitat;
2) Creation of new forest edges (measured 300 feet from edge of construction workspace);
3) Fragmentation of forest cores to create patches; and
4) Reduction in the size of forest cores.

In total, the ACP and SHP would result in loss of 4,892 acres of interior forest habitat, and create 30,025 acres of new forest edge habitat extending 300 feet from the edges of construction workspace. Permanent removal of forest habitat for the operation of the ACP and SHP, as well as the time that would be needed for wildlife habitat to recover within the temporary right-of-way, would be long-term to permanent. Construction of SHP would not result in forest fragmentation in Pennsylvania.

The landscape that would be crossed by ACP and SHP has already experienced some fragmentation in the form of existing roads, other utility rights-of-way, residential and commercial development, mining operations, and clear cuts. This is evidenced by the data provided in the state tables, which shows approximately 72 percent of the total number of interior forest blocks that would be impacted by ACP are patch and small core interior forest categories (general habitat in Virginia ecological core). In areas where the pipeline facilities would be collocated with existing cleared corridors, ACP and SHP generally would not increase the linear amount of edge, but would incrementally widen existing corridors typically by 25 to 50 feet during operation, further extending edge effects into the interior forest block. It is important to note that approximately 91 percent of the access roads proposed for use on ACP are existing access roads (based on construction land requirements; see table 2.2-1); therefore, additional impacts from forest fragmentation would not be expected in these locations. On one hand, further impacts to already fragmented interior forest patches and small cores may seem environmentally preferable to impacts to larger and more intact forest cores; however, as noted in the discussion above, further reduction of fragmented areas and increased proportion of edge habitat has been shown to more significantly degrade the quality of interior forest habitat, and result in reduction of species persistence and richness within those patches (Haddad et al. 2015).

Although the majority of impacts in terms of number of cores crossed would occur to already fragmented forest blocks, approximately 77 percent of the areal coverage impacts associated with forest loss and edge effect would occur in the medium to large core interior forest categories (includes moderate to outstanding Virginia ecological cores). Apart from the direct loss of forest coverage in these medium to large cores, ACP and SHP would fragment these cores into one or more smaller cores or patches as illustrated in figures 4.5.6-1 through 4.5.6-4. In addition, the newly fragmented cores or patches would also be subject to the edge effects described above extending from the edge of the workspace.

Based on interior forest fragmentation studies described above, although the impact acreages on moderate to large interior forests are large, there is minimal loss in forest cover relative to acres of interior forest available in the blocks crossed by ACP and SHP as presented in table 4.5.6-1 through 4.5.6-3 in Virginia and West Virginia. As illustrated in figures 4.5.6-1 through 4.5.6-3, ACP and SHP traverse through large interior core blocks that would continue to serve as a "source" to adjacent cores or patches fragmented because of the construction and operation of ACP and SHP, or due to other existing fragmentation. The ACP and SHP rights-of-way would be restored and maintained in a vegetative state. As discussed above, isolation resulting from fragmentation varies by species, but generally occurs at shorter distances for plants (tens to hundreds of meters), invertebrates, amphibians, reptiles, and small mammals (less than 1 km), to large mammals and birds (several kilometers). At its widest, the construction right-of-way would be 125-feet-wide through forested communities. Following construction, only 10 feet centered over the pipeline would be maintained in an herbaceous state, and trees within 15 feet of the pipeline would be removed during operations. Although we recognize in section 4.4 and throughout this EIS that regeneration of forested habitat would be long term, it is unlikely that the pipeline rights-of-way would serve as a long-term barrier to plant or wildlife movement, with the possible exception of some sensitive plant species, or wildlife species with very limited mobility. Edge effects described above could still occur along the newly fragmented forest blocks.

In contrast, as illustrated in figure 4.5.6-4, there is more limited interior forested habitat along the ACP route in North Carolina, which has already been fragmented by existing development, and occurs in isolated patches. Most of the interior forest that would be crossed by ACP in North Carolina consist of small and medium cores, and the nine large cores that would be crossed would be fragmented into one or more smaller cores that may compromise the core's ability to serve as a source to adjacent fragmented cores. Because the interior forest habitat crossed by ACP in North Carolina is already isolated as illustrated in figure 4.5.6-4, it is possible that the quality of the remaining habitat is low. Regardless, ACP would further contribute to the reduction in fragment area, increased fragment isolation, and increased proportion of edge habitat that would likely result in further degraded ecosystems, reduced species persistence, species richness, nutrient retention, trophic dynamics, and possibly wildlife movement.

Edge effects, such as increased predation, changes in microclimate and community structure along the newly formed forest edge, and spread of noxious and invasive species would also have the potential to occur along the construction and operations rights-of-way. Atlantic and DETI would reduce some of these impacts by restoring the rights-of-way following construction according to the FERC *Plan* and *Procedures* (see table 2.3.1-1) and Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F). Atlantic and DETI would also control the spread of noxious and invasive plants along the rights-of-way as described in the *Invasive Plant Species Management Plan* (see table 2.3.1-1).

We received several comments from state agencies, including the WVDNR, VDGIF, and NCWRC requesting that the FERC require compensatory mitigation for the loss of forest coverage and related edge effects resulting from construction of ACP and SHP. Habitat Equivalency Analyses (HEA) are a means to determine the amount of compensatory restoration required to provide services that are equivalent to the interim loss of natural resource services following an injury. HEAs are used by the FWS as one of many conservation measures that may be used to mitigate impacts to migratory birds and threatened and endangered species; it is important to note that HEAs are a voluntary measure. Atlantic and DETI will no longer be conducting an HEA with the FWS for ACP or SHP. Although we agree that compensatory mitigation is one way to off-set the impacts resulting from forest loss and fragmentation, there are other measures described here and in section 4.4.6 that would reduce fragmentation and edge effects. Additional measures would be applied on NFS lands as discussed in sections 4.4.8 and 4.5.9. Atlantic is required to obtain the necessary permits and authorizations required to construct and operate the project. As such, to the extent the state has regulatory authority and permitting jurisdiction for these features, Atlantic and DETI would consult with the appropriate state agency. State agencies would have the opportunity to review Atlantic's and DETI's proposed crossings during the permitting process and, if necessary, identify additional mitigation measures beyond that proposed. In addition to the mitigation measures described above, Atlantic and DETI would implement the following measures to reduce fragmentation and adverse effects of construction and operation of the projects on forest species:

- incorporate regionally specific and native forb (flowering plant) mixes in the traditionally all-grass seed mixes to provide food and habitat for pollinators and local wildlife species;
- provide mitigation for impacts on sensitive environmental resources, including migratory birds (see the *Migratory Bird Plan* [see table 2.3.1-1]) and listed species habitat;
- restrict maintenance mowing to occur outside of the bird nesting season for migratory birds;
- work with the FWS to identify conservation easements or sites where forested areas could be restored to provide replacement bat habitat in the counties crossed or adjacent to ACP and SHP (see section 4.7.1.3); and
- Atlantic would acquire a 400-acre conservation site adjacent to the MNF to provide offsite mitigation, opportunities for bat habitat enhancement, and long-term preservation of bat roosting and suitable hibernacula habitat near ACP. Activities planned include creation of watering/foraging pools, installation of artificial roost structures (e.g., rocket boxes and BrandenBark) (see section 4.7.1.3).

4.5.7 Noxious and Invasive Species

Short- or long-term impacts on wildlife habitat could occur if pipeline construction spreads noxious weeds and other invasive species. Noxious weeds can outcompete native vegetation and displace native species by spreading rapidly and co-opting resources (i.e., nutrients, water, and sunlight) that can eventually lead to a weed-dominated monoculture. Such transformed habitat can be unsuitable to former wildlife inhabitants. Often, as habitat quality degenerates, wildlife diversity declines. For example, kudzu, Japanese stiltgrass, and multiflora rose can form dense monocultures that inhibit native vegetation from flourishing, cause a decrease in species diversity, limit water flow and wildlife access to water, and in some instances, make waterfowl nesting areas unsuitable. The tree of heaven is another example of a highly aggressive invasive species that becomes rapidly established along forest edges, fields, and roadsides where it limits habitat for other species. Fragmentation of forest habitats is often associated with increased invasive species, noxious weeds, and pests such as cowbird parasitism and raccoon predation. Invasive species can also greatly impact pollinator species such as monarchs, rusty-patched bumble-bees, and the West Virginia white butterfly.

We received comments on the draft EIS regarding invasive insect and aquatic species. Specifically, the VDCR identified the emerald ash borer, sirex woodwasp, and red imported fire ant as species of high concern in Virginia, and the VDACS is concerned about the spread of European gypsy moth. The emerald ash borer (*Agrilus planipennis*) is an invasive insect from Asia that kills ash (*Fraxinus spp*.) trees (National Invasive Species Information Center, 2017a). The only confirmed population of emerald ash borer in Virginia is in Fairfax County (Emerald Ash Borer Information Network, 2017), which is over 100 miles from the proposed route. Sirex woodwasp (*Sirex noctilio*) feeds on healthy pine species and serves as a vector for a fungus that kills pine trees (National Invasive Species Information Center, 2017b). The sirex woodwasp has not been reported in any of the counties crossed by ACP or SHP (FS, 2017b). The red imported fire ant (*Solenopsis invicta*) is an invasive insect from South America that feeds on agricultural crops and can girdle young trees. Red imported fire ants commonly move to new, non-infested areas naturally, or by hitchhiking on agricultural commodities such as hay bales (APHIS, 2017a). The European gypsy moth (*Lymantria dispar*) is native to Europe and feeds on the leaves of more than 300 species of trees and shrubs in the caterpillar stage. Once defoliated, the trees and shrubs become vulnerable to diseases and other pests and can eventually be killed (APHIS, 2017b). To reduce the spread of gypsy moth, wash stations would be placed along the proposed route at the border of Virginia and North Carolina. Additionally, Atlantic is coordinating with the VDACS to conduct specialized gypsy moth training for Atlantic's contractor during construction. Atlantic and DETI would control the potential transport of invasive insect species through adherence to federal and state-specific regulations, including restrictions for the movement of equipment and vegetation to and from counties under state or federal quarantines. Section 4.6.4 discusses aquatic invasive species. Measures to control and monitor invasive plant species along the right-of-way are described section 4.4.4.

4.5.8 Noise

Noise would be generated by heavy equipment and machinery during construction of ACP and SHP. Most construction activities would be limited to daytime hours, except for a limited number of 24-hour activities, such as water pump operation, road bores, and HDD installations. Construction is anticipated to occur throughout the year and would generally last 6 to 12 weeks at any given location. Noise levels along the construction right-of-way would vary depending on the phase of work, equipment in use, distance from noise receptors, and intervening topography. We estimate that at 50 feet from ACP and SHP work areas, general construction would generate noise levels of about 85 decibels on the A weighted decibel scale (dBA), and about 92 dBA at 50 feet because of HDD operations for ACP (see section 4.11.2.2).

Wildlife relies on hearing for courtship and mating, prey location, predator detection, and/or homing. These behaviors and interactions could be affected by noise resulting from construction and operation of the projects. Specifically, construction noise could lead to aversion of an area, territory abandonment, nest abandonment, egg failure, reduced juvenile growth and survival, or malnutrition or starvation of the young. However, studies note that separating the effects of acute increases in noise levels from the optical stimulus that often accompany such noises (e.g., the loud noise of a low-flying aircraft and the observation of the approaching aircraft) can be difficult (Kempf and Huppop, 1997). Thus, during construction, the effects of noise on wildlife would be greatest immediately adjacent to the construction right-of-way.

While pipelines generally have no operational noise associated with them, compressor stations would generate noise on a continuous basis once in operation. Continuous noise impacts associated with the compressor stations would be limited to the general vicinity of the facilities. Noise levels at 50 feet from ACP and SHP compressor stations could range from 68 dBA to 80 dBA. Noise levels for planned maintenance blowdown events could range from 75 dBA to 85 dBA at 50 feet, respectively, but would occur infrequently and would be short-term less than 10 minutes in duration. In addition, Atlantic would employ mobile blowdown silencers during each planned blowdown event to reduce noise to meet 85 dBA at 50 feet. Unplanned blowdowns because of emergency events are very infrequent and would be unsilenced to purge the pipeline as quickly as possible; the associated noise level of an emergency blowdown would be about 100 dBA at 1,000 feet from the valve or meter site. Section 4.11.2.2 provides a more in-depth description of noise levels during operation of the compressor stations associated with ACP and SHP.

Effects on wildlife from chronic noise may vary by species (e.g., Barber et al., 2009; Francis et al., 2011a, 2011b; Francis et al., 2012; Blickley et al., 2012). The number of individual birds present near oil and gas infrastructure has been shown to decline with proximity to the facility, but reproductive success was higher than expected, seemingly due to a proportionate decline in the presence of nest predators (Francis et al., 2011a). In another instance, increased noise levels from oil and gas infrastructure appeared to reduce reproductive success, potentially due to an inability of the females of the species to adequately hear male courtship songs (Habib et al., 2006). Another study concluded that species may be able to adjust to chronic noise by changing their vocalizations in ways that would allow them to be better heard (Francis et al., 2011b). These negative effects of anthropogenic noise on breeding behavior and success could also be expected in breeding frogs (Kaiser et al., 2011; Lengagne, 2008). Additionally, bat species would be expected to have a decrease in foraging productivity (Schaub et al., 2008), which would also lead to a decrease in fitness (and possibly death) for both the females and young.

Noise levels decrease exponentially with distance from the source, and this decrease is accelerated within forested areas relative to the type of forest and the extent of understory present (Huisman and Attenborough, 1991). ACP and SHP compressor stations are primarily surrounded by forested land. Atlantic and DETI would also employ noise mitigation measures at the compressor stations, such as compressor building walls, roof, doors, and ventilation systems designed to reduce noise emissions; turbine exhaust and intake silencers and breakouts; blowdown silencers; underground suction and discharge piping; and acoustically lagged aboveground main gas piping. The noise levels that wildlife would be exposed to beyond the compressor station property boundaries would vary based on the distance from the facility, but would be lower than the maximum noise levels provided above. A full description of the noise impacts associated with operation of ACP and SHP compressor stations is provided in section 4.11.2.2. We conclude that in the years following initial construction birds and other wildlife would either become habituated to the operational noise associated with compressor station facilities or move into similar available habitat farther from the noise source.

During the operation of the pipeline, noise would also be generated during monitoring and maintenance activities, such as vegetation clearing on the permanent right-of-way, or during ground or air surveillance of the pipeline, as required by DOT regulations. Surveillance activities could cause startle effects in wildlife in proximity to the pipeline; however, these activities would be infrequent and short-term in duration. Overall, we conclude that effects on wildlife due to noise emissions would be minimal and highly localized.

4.5.9 Wildlife Resources and Habitat on Federal Lands

The impacts on wildlife species within the MNF and GWNF would be consistent with those described above for wildlife species in other portions of the ACP right-of-way. Atlantic would reduce impacts on the MNF and GWNF by implementing the various BMPs and plans described above, and in section 4.4.8, and by revegetating temporary and permanent workspaces with seed mixes developed in coordination with MNF and GWNF. Regarding pollinator habitat, Atlantic has committed to continue coordinating with the MNF and GWNF to determine the appropriate seed mixes and application techniques on NFS lands. In addition, Atlantic has committed to including species-specific tree and shrub seedlings and/or seed mixes to enhance wildlife habitat for certain RFSS species discussed in section 4.7.3 and tables R-1 and R-2 of appendix R. However, Atlantic's *COM Plan* (see appendix G) for activities on NFS lands does not include the final seed mixes that would be required by the MNF and GWNF. The FS is reviewing the *COM Plan*, and will coordinate with Atlantic on the final plan.

To expedite the establishment of wildlife habitat on NFS land, Atlantic would replant all ATWS, temporary access roads, and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, with a combination of indigenous tree and shrub seedlings per the *COM Plan*. The mix of tree and shrub species would be determined in consultation with the MNF and GWNF. The permanent right-of-way on the MNF and GWNF would be maintained according to the

FERC *Plan* to reduce the effects of forest fragmentation and impacts on visual resources on NFS lands. The right-of-way would be maintained in an herbaceous state for a 10-foot-wide corridor centered over the pipeline, and the remainder of the corridor would be seeded with seed mixes and then replanted with shrubs and shallow rooted trees as approved by the FS and consistent with the FERC *Plan*. Atlantic would consult with the FS to finalize plans for the restoration and rehabilitation of the right-of-way included in the *COM Plan*.

Restoration of the temporary construction right-of-way and temporary access roads would provide early successional habitat adjacent to the forested landscape, as recommended for upland areas. Temporary workspaces along waterbody crossings would also be revegetated with seeds of native tree and shrub species and the permanent right-of-way would be planted with herbaceous vegetation. To facilitate the re-establishment of a diverse forest within the disturbed construction right-of-way, restoration of forested riparian areas would include seeding and may include, in limited specific locations required and/or approved by the appropriate agencies, supplemental plantings of tree seedlings and shrubs. Any proposed enhancement of the forested riparian area restoration using plantings of native shrubs and trees would exclude a 10-foot-wide corridor centered over the pipeline that would be retained in an herbaceous state.

4.5.9.1 Interior Forest Habitat Fragmentation and Edge Effects on Federal Lands

Refer to section 4.5.6 for a detailed discussion of the impacts on interior forest habitat associated with fragmentation and edge effects, and for a discussion of the sources and methodology utilized to calculate these impacts.

Monongahela National Forest

ACP would cross 1 large interior forest block (WV Core-32) covering 2,015,583 acres on NFS lands in West Virginia. Direct impacts would result in the loss of 869 acres of interior forest habitat, including 413 acres from construction and 455 acres from operation of the pipeline (see table 4.5.9-1 and figures 4.5.6-1a and 4.5.6-1b). Edge and perforated habitat types were not included in these calculations because, per the definition provided in section 4.5.6, these are open habitats between forest edges; therefore, the placement of the pipeline within these boundaries would not contribute to additional loss of forest coverage. In addition, construction of ACP on NFS lands in West Virginia would create 6,564 acres of new forest edge measured 300 feet from the edge of the workspace into the interior forest block.

TABLE 4.5.9-1

Interior Forest Affected by the Atlantic Coast Pipeline on the Monongahela National Forest [a]

Category [b]	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Large Core	1	2,015,583	413.2	455.3	868.5 (<1%)	6,563.6 (<1%)
Totals	**1**	**2,015,583**	**413.2**	**455.3**	**868.5 (<1%)**	**6,563.6 (<1%)**

[a] The impact calculations represent the total forest loss and edge effect to the interior forest core block, which extends beyond the boundaries of the MNF; actual forest loss and edge effect within the boundaries of the MNF would be less.

[b] Large Core = more than 500 acres.

Source: West Virginia state forest block data produced by the NRAC at West Virginia University.

George Washington National Forest

Within the GWNF, ACP would cross 16 ecological cores, including seven categorized as Outstanding (includes VA Core-01, -08, -11, and -12), and seven as Very High (VA Core-04 through -07, -09, -10, and -13. Direct impacts would result in the loss of 731 acres of interior forest habitat, including 410 acres from construction and 321 acres from operation of the pipeline (see table 4.5.9-2 and figure 4.5.6-3). In addition, construction of ACP on NFS lands in Virginia would create 4,289 acres of new forest edge. As noted in table 4.5.9-2, impacts would be greatest on the very high and moderate ecological core types, causing further fragmentation and associated edge effects to those block habitats crossed by ACP.

TABLE 4.5.9-2

Interior Forest Affected by the Atlantic Coast Pipeline on the George Washington National Forest [a]

Category	Number of Interior Forest Blocks Crossed	Interior Forest Blocks Crossed (acres)	Loss of Interior Forest associated with Construction (acres)	Loss of Interior Forest associated with Operations (acres)	Total Loss of Interior Forest (acres) / Percent of Total (%)	Creation of Edge (acres) / Percent of Total (%)
Outstanding	7	296,289.4	144.0	103.9	247.9 (<1%)	1,352.9 (<1%)
Very High	7	73,889.6	240.4	201.4	441.8 (<1%)	2,739.9 (4%)
Moderate	1	1805.9	25.5	15.5	41.0 (2%)	*194.0 (11%)*
General	1	1449.7	0.0	0.0	0.0 (0%)	2.4 (<1%)
Totals	**16**	**373,434.6**	**409.9**	**320.8**	**730.7 (<1%)**	**4,289.2 (1%)**

[a] The impact calculations represent the total forest loss and edge effect to the interior forest core block, which extends beyond the boundaries of the GWNF; actual forest loss and edge effect within the boundaries of the GWNF would be less.

Source: VDCR-NHP VaNLA project.

In addition to replanting trees and shrubs on the outer edges of the construction right-of-way, next to the naturally regenerating forest land within the GWNF and MNF, Atlantic would shape or feather the right-of-way edges by retaining forest vegetation up to 10 feet into the construction right-of-way along the pipeline corridor that are visible to the public. Atlantic has also committed to replant all ATWS and the outermost portions of the pipeline construction workspace (20 feet on working side and 13 feet on spoil side) with a combination of indigenous tree and shrub seedlings on NFS lands. Atlantic would also employ the least intrusive tree removal methods to reduce damage to adjacent forest habitat, and retain large-diameter trees or snags at the periphery of the construction area, where possible, to further reduce habitat impacts. These mitigation measures would reduce the edge effect of the pipeline corridor and provide escape cover for species such as small mammals, reptiles, and amphibians needing to cross the permanently maintained corridor. The location and extent of the tree and shrub plantings and areas of selective clearing of trees and vegetation are pending additional consultation with the FS.

Atlantic would also adhere to its *Non-Native Invasive Plant Species Management Plan* (see section 11.0 of the *COM Plan* [appendix G]) to ensure that invasive species are adequately controlled and native forage seeding is successful. As mentioned in section 4.4.4, aerial spraying would not be used for invasive species control along the right-of-way; only minimal hand or targeted spot spraying would occur. No spraying would be conducted within 25 feet of federally listed species or karst features. All herbicide use would comply with MNF and GWNF Forest Plan Standards, which are designed to protect sensitive species and habitats on both Forests.

Short-term impacts on game species and hunting within the MNF and GWNF may occur during construction. As with other portions of the right-of-way, game species would be temporarily displaced during construction. Following construction, game species could utilize the newly established rights-of-way for foraging and travel. Permanent impacts on game species would occur where herbaceous vegetation is maintained in place of forested habitat within the MNF and GWNF. However, forage vegetation, such as shrubs and grasses, would be expected to recolonize after restoration.

As indicated in Atlantic's draft *COM Plan* (see appendix G), Atlantic would comply with the state-specific FWS TOYR for migratory birds (see table 4.5.3-1) on the MNF and GWNF. Atlantic has committed to not conduct routine vegetation mowing or preconstruction tree clearing during the nesting season during operation unless specifically approved in writing by the responsible land management agency, or the FWS, and FERC. Once tree clearing has been completed, Atlantic would construct during the nesting season.

Atlantic did not document bald eagle nests or winter roosts or golden eagle roosts within the MNF or GWNF during its surveys in 2016, although individual bald and golden eagles were observed. As described in section 4.5.3, during construction on the MNF and GWNF, Atlantic would implement additional conservation measures to protect bald and golden eagles, including utilizing a qualified Biological Monitor ahead of construction crews to search for roosting or nesting bald or golden eagles (far enough ahead to identify eagle presence prior to noise disturbance from construction activities), stopping work if one is identified, and contacting the FWS within 24 hours of any identification. Atlantic would also maintain a 1,500-foot buffer around active or inactive bald eagle nests when eagles are present within the MNF and GWNF.

Additional avoidance and mitigation measures that would apply to wildlife and wildlife habitat are discussed in the *COM Plan* (appendix G). Potential impacts and conservation measures for FS-managed species (i.e., RFSS, management indicator species [MIS], and locally rare) are discussed in section 4.7.3 and appendix R.

4.5.10 Conclusion

We conclude that constructing and operating ACP and SHP would not significantly affect common wildlife species at range-wide population levels, although local populations could be negatively impacted and/or extirpated. Based on our review of the potential impacts on wildlife habitat as described above and in section 4.4, we conclude that the primary impact from construction and operation would be on forested habitats crossed by ACP and SHP, including the removal of 6,136.6 acres of forested vegetation (includes 2,744.7 acres of permanent impacts), and fragmentation of interior forest blocks (see section 4.5.6). Fragmentation of forested habitat would make the right-of-way, and the intact forest that it crosses, permanently unsuitable for interior forest species, but may create new habitat for species that prefer ecological edges. Atlantic and DETI would reduce these impacts through the implementation of their construction and restoration plans (see table 2.3.1-1), in addition to our recommendations made throughout this EIS; however, due to the length of time required to recover forested habitat, these impacts would be considered long-term to permanent.

As discussed in section 4.5.2.4, Atlantic has the potential to have significant adverse impacts on subterranean habitat and the species associated with this habitat type. The development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, as discussed in section 4.3.1.7, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's and DETI's *Karst Mitigation Plan* (appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts; however, subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a); therefore, it is possible that impacts associated with construction activities could have population level effects on these species. Additional discussions on subterranean habitat and the species associated with this habitat type are provided in section 4.7 and appendices R and S.

4.6 FISHERIES AND AQUATIC RESOURCES

4.6.1 Existing Aquatic Resources

In ACP and SHP project areas, aquatic habitat varies from small to large rivers, warm to cold water streams, springs, and from the high elevation streams of the Appalachian Mountains, to the broad river floodplains in the Atlantic Coastal Plain of North Carolina (WVDNR, 2015a; NCWRC, 2015a). There are 1,556 waterbody crossings on ACP (some waterbodies are crossed more than once; this includes wetland-waterbody complex crossings identified in appendix K), including 587 perennial streams, 624 intermittent streams, 228 ephemeral streams, 49 canal/ditch features, and 68 open water, wetland/waterbody complexes, and reservoirs. There are 135 waterbody crossings on SHP (some waterbodies are crossed more than once), including 115 perennial streams and 18 intermittent streams. Section 4.3.2 describes the waterbodies that would be crossed by ACP and SHP; appendix K includes a list of all waterbodies crossed by the projects.

A number of these crossing locations have the potential to provide habitat for fish, including both warmwater and coldwater fish species. Although other proposed crossing sites may be located upstream of known or suspected habitat for fish species, these sites are hydrologically and ecologically connected fish bearing stream networks and therefore influence conditions in downstream fisheries. Fish species commonly found in the waterbodies crossed by ACP and SHP are listed in table 4.6.1-1. Because of fish species mobility, they tend to be less vulnerable to extirpation or extinction relative to other taxa groups; however, chronic pollution and habitat loss can lead to reduced ranges and reduce their ability to re-establish (NCWRC, 2015a).

Table 4.6.1-2 lists the construction TOYR for fisheries crossed by ACP and SHP. Additional fisheries resources that exist in the ACP and SHP project area include game and commercial fisheries and hatcheries. Publicly available information, including previously identified surface water or fisheries classifications, state maps, and administrative code, was used to identify potential fish-bearing waterbodies, fish species that may be present in these waterbodies, and where there may be knowledge gaps or incomplete information. Additional information was requested from resource agencies and used to fill gaps when possible. The state/commonwealth fisheries resources that occur in the ACP and SHP project area are described below.

TABLE 4.6.1-1

Representative Fish Species in Waterbodies Crossed by the Atlantic Coast Project and Supply Header Project

Pennsylvania	
Warmwater Fishes	
No waterbodies supporting warmwater fish would be crossed by SHP in Pennsylvania.	
Coldwater Fishes	
Brook trout (*Salvelinus fontinalis*)	Rainbow trout (*Oncorhynchus mykiss*)
Brown trout (*Salmo trutta*)	Redside dace (*Clinostomus elongates*)
Least brook lamprey (*Lampetra aepyptera*)	Walleye (*Sander vitreum*)
Muskellunge (*Esox masquinongy*)	
West Virginia	
Warmwater Fishes	
Brook silverside (*Labidesthes sicculus*)	Largemouth bass (*Micropterus salmoides)*
Channel catfish (*Ictalurus punctatus*)	Smallmouth bass (*Micropterus dolomieu*)
Common carp (*Cyprinus carpio*)	White bass (*Morone chrysops*)
Flathead catfish (*Pylodictis olivaris*)	Yellow perch (*Perca flavescens*)
Coldwater Fishes	
Blacknose dace (*Rhinicthys atratulus*)	Muskellunge (*Esox masquinongy*)
Brook stickleback (*Culaea inconstans*)	Rainbow trout (*Oncorhynchus mykiss*)
Brook trout (*Salvelinus fontinalis*)	Sauger (*Stizostedion canadense*)
Brown trout (*Salmo trutta*)	Shiners (*Luxilus* spp.; *Lythrurus* spp.; *Notropis* spp.)
Fantail darter (*Etheostoma flabellare*)	Walleye (*Sander vitreus*)
Mottled sculpin (*Cottus bairdi*)	
Virginia	
Warmwater Fishes	
Alewife [a] (*Alosa pseudoharengus*)	Longnose gar (*Lepisosteus osseus*)
American shad [a] (*Alosa sapidissima*)	Redear sunfish (*Lepomis microlophus*)
Bowfin (*Amia calva*)	Striped bass [a] (*Morone saxatillis*)
Fathead minnow (*Pimephales promelas*)	White crappie (*Pomoxis annularis*)
Flathead catfish (*Pylodictis olivaris*)	Yellow perch (*Perca flavescens*)
Golden shiner (*Notemigonus crysoleucas*)	
Largemouth bass (*Micropter us salmoides*)	
Coldwater Fishes	
Blacknose dace (*Rhinichthys atratulus*)	Longnose dace (*Rhinichthys cataractae*)
Brown trout [a] (*Salmo trutta*)	Mottled sculpin (*Cottus bairdii*)
Brook trout [a] (*Salvelinus fontinalis*)	Rainbow trout (*Oncorhynchus mykiss*)
Chain pickerel (*Esox niger*)	Torrent sucker (*Thoburnia rhothoeca*)
Faintail darter (*Etheostoma flabellare*)	Walleye (*Sander vitreus*)
Least brook lamprey (*Lampetra aepyptera*)	
North Carolina	
Warmwater Fishes	
Alewife [a] (*Alosa pseudoharengus*)	Hickory shad [a] (*Umbra pygmaea*)
American eel [b] (*Anguilla rostrata*)	Mud sunfish (*Acantharchus pomotis)*
Blue catfish (*Ictalurus furcatus*)	Striped bass [a] (*Morone saxatillis*)
Blueback herring [a] (*Alosa aestivalis*)	
Bluegill (*Lepomis macrochirus*)	
Coldwater Fishes	
No waterbodies supporting coldwater fish or trout species would be crossed by ACP in North Carolina.	

[a] Anadromous species (brook and brown trout are not anadromous in Virginia)

[b] Catadromous species

Source: WVDNR, 2015a; VDGIF, 2015b; NCWRC, 2015a.

TABLE 4.6.1-2

Construction Time of Year Restrictions for Fisheries Crossed by Atlantic Coast Pipeline and Supply Header Project

State	Fishery Classification	TOYR
Pennsylvania	High Quality (HQ)- Coldwater Fisheries (CWF)	October 1-December 31
	Trout Stocking Fisheries (TSF)	March 1-June 15
West Virginia	WWF	April 1-June 30
	Trout Fisheries (includes coldwater High Quality Streams)	September 15-March 31
	CWF (perennial CWF within MNF only); additional sediment/erosion control measures applied for activities within 100 feet	October 1-June 1
	Warmwater Fisheries (WWF)	April 1-June 30
Virginia	Wild Brown and Brook Trout Waters [a]	October 1-March 31
	Rainbow Trout Waters [a]	March 15-May 15
	Roanoke logperch	March 15-June 30
	Orangefin madtom (native population only)	March 15-May 31
	Roughhead shiner	March 15-June 30
	Freshwater mussels - long-term brooder (brook floater, green floater, yellow lampmussel)	April 15-June 15 (release of glochidia); August 15-September 30 (spawning)
	Freshwater mussels - short-term brooder (Atlantic pigtoe, James spinymussel, yellow lance)	May 15-July 31
	Dwarf wedgemussel	March 15-May 31; August 15-October 15
	Anadromous Fish Use Areas [b]	February 15-June 30 (variations for certain waterbodies)
North Carolina	Freshwater Mussels (no grubbing with 50 feet of surface waters with ESA sensitive species [see section 4.7.1 and appendix K])	November 15-April 1
	Anadromous Fish Spawning Areas	February 15-June 30
	Primary Nursery Area	February 15-September 30
	Atlantic and shortnose sturgeon	February 1-June 30

[a] This TOYR applies to in-stream work within the designated water and within perennial and intermittent (when there is flow) tributaries within 1 river mile upstream of the designated water (A. Ewing, personal communication, April 12, 2017).

[b] In Confirmed Anadromous Fish Use Areas, this TOYR applies to in-stream work within the designated water and within perennial and intermittent (when there is flow) tributaries within 1 river mile upstream of the designated water. In Potential Anadromous Fish Use Areas, this TOYR only applies to the designated water (not the tributaries) (e.g., Nansemond River, Western Branch Elizabeth River, and James River) (A. Ewing, personal communication, April 12, 2017).

Appendix K describes each waterbody crossing location by ACP and SHP facility type (e.g., access road, temporary or permanent right-of-way, compressor station), approximate milepost, waterbody (feature) name, and crossing length, and identifies if blasting or water withdrawal is proposed at that crossing location. In addition, appendix K describes the applicable state and federal waterbody classifications, identifies potential ESA-listed, state-listed, or FS-managed aquatic species present, and applicable conservation measures, including TOYR by waterbody. During our review of the ACP Master Waterbody Crossing Table (5/8/17 version), we noted some discrepancies when compared to other supplemental information provided by Atlantic. Atlantic introduced the "No Impact" category to the "Construction Method" column; however, upon review of project mapping, it appears that these are proposed access roads that would be used during construction that abut the waterbodies. As described in section 4.6.4, increased sedimentation is a potential impact from use of adjacent access roads, and additional erosion control measures would need to be implemented on access roads within 300 feet of ESA sensitive streams (refer to section 4.7.1), and should be identified in Atlantic's and DETI's final Master Waterbody Crossing Table. Access roads with significant erosion potential within 0.25 mile of ESA sensitive waterbodies should also be identified in the final table. In the current table (appendix K), we have modified the “No Impact” category to “Abuts Access Road,” and are assuming that no work would be required within these waterbodies. In addition, based on our recent correspondence with the FWS and state agencies, we noted that the TOYR for some waterbodies were incorrect, or conservation measures were incorrect or incomplete. Atlantic has also identified two waterbodies, Black River and Little Swamp Marsh as NRI segments that would be crossed by ACP (see table 4.8.5-3); however, these waterbodies were not included with the most recent Master Waterbody Crossing table. In appendix K, we have provided a “FERC Recommended Conditions” column that identifies the revisions or clarifications needed for each waterbody. **We recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, revised Master Waterbody Crossing tables for ACP and SHP that address the recommended conditions in the identified column of appendix K of the EIS, and that include all NRI segments crossed. The revised table or accompanying filing should document correspondence and input from the appropriate federal and state agencies regarding the updated information and any additional mitigation measures Atlantic and DETI will incorporate for each waterbody.**

Several other aquatic wildlife species occupy aquatic habitats found in the ACP and SHP project area, including aquatic salamanders such as the eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) and northern dusky salamander (*Desmognathus fuscus*), which can be found within the streams or in riparian habitat. Several species of crayfish are also found in ACP and SHP project area, including six species endemic to West Virginia (WVDNR, 2015a). Crayfish diversity in the southeastern U.S. comprise 90 percent of the total species found east of the Rocky Mountains, primarily in the southeastern U.S. (NCWRC, 2015a). Crayfish are an important forage species for several game fish and provide subterranean refuges for terrestrial organisms through the creation of burrows. There are several species of freshwater mussels found in the ACP and SHP project area. Federal and state-listed mussel species are discussed in sections 4.6.2, 4.7.1, and 4.7.4. Generally, habitat fragmentation, degradation of water quality, and introduction of invasive species threaten these species (WVDNR, 2015a; NCWRC, 2015a).

Several species of mammals, waterfowl and shorebirds, toads, frogs, terrestrial salamanders, turtles, and some terrestrial insects such as dragonflies and damselflies also rely on aquatic habitats for some portion or their life cycle or as foraging habitat. These species are discussed in section 4.5.

4.6.1.1 West Virginia

In West Virginia, Title 47 CSR Series 2, *Requirements Governing Water Quality Standards*, provides the state’s water quality standards. Under 47 CSR 2, waterbodies in the state are categorized by designated use as defined in table 4.6.1-3.

TABLE 4.6.1-3 **West Virginia Fisheries Classifications**			
Designation [a]	Classification	Description [a]	Designating Agency
Public Waters	A	Waters, which, after conventional treatment, area used for human consumption.	WVDEP
Warmwater Fishery Streams	B1	WWF streams or stream segments that contain populations composed of all warmwater aquatic life. Streams are managed for or currently support warmwater fish species.	WVDEP
Trout Waters	B2	These waters sustain year-round trout populations, whether or not they are stocked. Excludes waters which receive annual stockings of trout but do not support year-round trout populations. In short, trout waters contain naturally reproducing or stocked trout, so long as trout survive year-round.	WVDEP
High Quality Streams	HQS	Streams or stream segments stocked with trout or that contain native trout populations and warmwater streams over 5 miles in length with public utilization of desirable fish populations	WVDNR
High Quality Waters	HQW	Streams or stream segments which receive annual stockings of trout but do not support year-round trout populations.	WVDEP

There are a total of 337 waterbody crossings in West Virginia. The ACP pipeline would have 154 waterbody crossings in West Virginia; 54 of these locations are classified as B2, HQS, and/or trout waters, or unnamed tributaries to B2, HQS, and/or trout waters (see appendix K). Seventy-six of the waterbody crossings are WWF or unnamed tributaries to WWF; 13 of which are also classified as HQS or unnamed tributaries to HQS WWF. The remaining waterbodies are coldwater fisheries, or unclassified waters. Coldwater and warmwater fish, including game fish, common to these waters are identified in table 4.6.1-1.

Blasting may be required in-stream or within 1,000 feet of 146 crossing locations in West Virginia. Water withdrawal for hydrostatic testing is currently proposed at Buckhannon River, a perennial HQS trout water (see section 4.3.2.7); based on agency comments on the draft EIS, Atlantic would seek municipal sources for most of its water needs.

Access roads proposed for use during construction of ACP would cross 173 waterbodies in West Virginia, which includes 60 crossing locations designated as warmwater habitat. Of the 60 warmwater habitat crossings, 15 are considered HQS or unnamed tributaries to HQS. The remaining 113 crossings include B2, HQS, and/or CWF or unnamed tributaries to B2, HQS, and/or CWF.

Six waterbody crossing locations (Hollick Run and unnamed tributary to Hollick Run) with warmwater habitat are associated with the construction of Compressor Station 1 (AP-1 MP 7.6 to 7.8) in Lewis County, West Virginia, and four waterbody crossing locations would be associated with the construction of temporary contractor yards.

SHP would not cross any waterbodies classified as B2 Trout Waters; however, there are 19 pipeline crossing locations of WWF HQS or unnamed tributaries to WWF HQS, and an additional 6 access road crossings of WWF HQS or unnamed tributaries to HQS. The SHP pipeline would cross 34 WWF, and 52 access roads are proposed across warmwater streams. Blasting is proposed in or within 1,000 feet of 53 of these waterbody crossing locations. Water appropriation is also proposed at two waterbodies: the McElroy Creek and South Fork Fishing Creek.

In addition, two WWF would be within the property boundaries of the Mockingbird Hill Compressor Station in West Virginia and one WWF would be affected by the installation of a cathodic protection ground bed.

Neither ACP nor SHP would impact public fishing lakes in West Virginia.

Potential impacts on aquatic resources that could result from the crossing methods, blasting, water appropriation, and construction and use of access roads are discussed in section 4.6.4.

4.6.1.2 Virginia

The Commonwealth of Virginia has established six designated use categories under Title 9 of VAC Agency 25 Chapter 260 Section 10 (Designation of Uses). Virginia waters are designated by the State Water Control Board as inland or tidal waters. Virginia further designates uses separately for Aquatic Life, Fish Consumption, and Shellfishing. Subcategories under the Aquatic Life designation specific to fisheries in the Chesapeake Bay and its tidal tributaries are Deep Channel Seasonal Refuge, Deep Water Aquatic Life, Migratory Fish Spawning and Nursery, and Open Water Aquatic Life. Subcategories under Aquatic Life to differentiate between CWF and WWF have not been adopted in the Commonwealth. Descriptions of each of the designated use categories are provided in section 4.3.2. There are a total of 890 waterbody crossing locations in Virginia.

Trout waters are a separate subset classified by the VDGIF. Under Title 9 of VAC Agency 25 Chapter 260 Section 370, the VDGIF categorizes coldwater or trout waters into eight classes based on aesthetics, productivity, resident fish population, and stream structure. Trout waters Classes I through IV are rated as wild trout habitat, while Classes V through VIII are rated as coldwater habitat not suitable for wild trout, but adequate for stocked trout (i.e., stockable trout streams). Based on spatial data from VDGIF, all coldwater or trout streams crossed by AP-1 in Virginia occur in the western portion of the Commonwealth between MPs 85.0 and 164.4, west of US 29 (VDGIF, 2011a). Appendix K identifies 69 wild trout stream or unnamed tributaries to wild trout stream, and four additional stockable trout stream pipeline crossing locations (four waterbodies are both wild trout and stockable trout waters). The VDGIF requested that Atlantic consult with the VDGIF Region IV Aquatics Resources Manager, Paul Bugas, regarding stockable trout waters to ensure avoidance of stocking and/or angling activities during ACP construction and long-term operation (see appendix K). Blasting may be required in-stream or within 1,000 feet of these crossing locations. Water withdrawal is currently proposed at three of these waterbodies (see section 4.3.2.7), including the Jackson River, Calfpasture River, and Jennings Branch.

The remainder of the 722 pipeline waterbody crossings in Virginia include 479 that are unclassified, not available, or not assessed 154 aquatic life waters or unnamed tributaries to aquatic life waters, 74 migratory fish spawning and nursery or unnamed tributaries to these waters, and 15 that are considered public fishing lakes or unnamed tributaries to public fishing lakes. Fish species, including game fish, common to these waters are identified in table 4.6.1-1. The Commonwealth of Virginia regulatory classification has not been assessed for 62 waterbody crossing locations; we recommend in section 4.6.1 that Atlantic confirm these classifications with the VDGIF and provide this information in the final Waterbody Crossing table with its Implementation Plan prior to construction.

Blasting may be required in-stream or within 1,000 feet of 502 of these locations, and water withdrawal is currently proposed at six of these waterbodies (see section 4.3.2.7), including Back Creek (AP-1 MP 87.2), James River, Appomattox River, Blackwater River, Prince Lake, and Western Branch Reservoir.

Atlantic is currently proposing 89 waterbody crossings for access roads in Virginia, including 31 wild trout or stockable trout streams, or unnamed tributaries to a wild brook trout or stockable stream. Seven waterbodies crossed by proposed access roads are unnamed tributaries to migratory fish spawning and nursery. The remaining 51 access road crossing locations are either unclassified, not assessed, aquatic life waters, or are unnamed tributaries to waterbodies that support aquatic life waters (see section 4.6.2).

Six additional unclassified waterbodies would be affected; four within the property boundaries of a temporary contractor yard, and one within the boundaries of a compressor station, and one associated with the installation of a cathodic protection ground bed.

Three public fishing lakes are located within 0.5 mile of the proposed AP-1 route: Braley Pond (approximately 0.5 mile north of AP-1 MP 116.3 in Augusta County); Twin Lake (approximately 0.3 mile south of AP-1 MP 249.1 in Dinwiddie County); and County Pond (approximately 0.5 mile west of AP-1 MP 278.0 in Brunswick County. Construction and operation of ACP would not affect these lakes. According to the Wildlife Environmental Review Map Service (WERMS) data, the proposed AP-3 lateral crosses two public fishing lakes in City of Suffolk County: Lake Prince at MP 61.0 and Western Branch Reservoir at MP 62.4. In addition, Lake Kilby is located approximately 0.5 mile south of the AP-3 lateral at MP 57.9 in City of Suffolk County, near its confluence with Pitchkettle Creek; however, construction and operation of ACP would not affect Lake Kilby.

Potential impacts on aquatic resources that could result from the crossing methods, blasting, water appropriation, and construction and use of access roads are discussed in section 4.6.4.

4.6.1.3 North Carolina

The North Carolina Division of Marine Fisheries (NCDMF) establishes and protects Primary Nursery Areas to protect waters that support embryonic, larval, or juvenile populations of marine or estuarine fish or crustacean species. ACP would not cross any surface waters with HQWs and ORV classifications, Tr, or CWF. The ACP pipeline route would cross 313 waterbodies in North Carolina. Two hundred and eighty-five of these waterbodies are class C waterbodies, which are protected for secondary recreation, fishing, wildlife, fish, consumption, and aquatic life; 10 waterbodies have a water supply III or IV rating, which indicates their use for drinking, culinary, or food processing, but which are also protected as a class C waterbody. An additional 8 waterbodies are anadromous fish spawning areas (AFSA), of which three are also inland Primary Nursery Areas (PNA) (see section 4.6.2.3), and 10 waterbodies are not available or unclassified. Most of these waterbodies have supplemental classifications, which include nutrient sensitive waters and swamp waters (Sw) (see appendix K). Blasting is currently proposed in-stream or within 1,000 feet of 68 of these locations. Water withdrawal is also proposed at the Tar River and Contentnea Creek, both perennial rivers (see section 4.3.2.7). Atlantic's proposed access roads would cross 11 waterbodies in North Carolina; all of which are class C waterbodies. Two additional class C waterbodies would be within the property boundaries of a temporary contractor yard, two class C waterbodies would be associated with the installation of a cathodic protection ground beds, and one class C waterbody would be within the property boundaries of an M&R station.

There are no TOYR in North Carolina associated with WWF. Warmwater fish, including game fish, common to these waters are identified in table 4.6.1-1. Potential impacts on aquatic resources that could result from the crossing methods, blasting, water appropriation, and construction and use of access roads are discussed in section 4.6.4. Some of these waterbodies are AFSA, which do have associated TOYR and are discussed in section 4.6.2.3.

4.6.1.4 Pennsylvania

In Pennsylvania, Title 25 of the Pennsylvania Code, Chapter 93 (2015), provides the Commonwealth's Water Quality Standards. All waters within Pennsylvania have been classified according to present condition and use. As discussed in section 4.3.2.2, the PADEP classifies waterbodies according to water quality and aquatic communities. In Chapter 93, waterbodies in the state are classified as: CWF, WWF, migratory fisheries, and trout stocked. Selected waterbodies are further classified as HQ or EV and given special protection. Waterbodies that are classified as HQ exceed levels necessary to support fish, shellfish, wildlife, and recreation, whereas waterbodies classified as EV are in significant natural areas, provide exceptional ecological significance, or are designated as a "wilderness trout stream". The PAFBC further classifies waterbodies supporting trout populations or providing habitat as: Approved Trout Water, Class A Trout Waters, Special Regulation Areas, Stream Sections that Support Natural Reproduction of Trout, and Wilderness Trout Streams; trout streams and their applicable tributaries are the only streams with a PAFBC-recommended crossing window.

SHP would cross two waterbodies classified as Trout Stocking Fisheries (TSF) (see appendix K). SHP would also cross waterbodies at six locations that are classified as HQ-CWF, or that are unnamed tributaries to HQ-CWF waterbodies, and four crossings of waterbodies that are unclassified. Coldwater fish, including game fish, common to these waters are identified in table 4.6.1-1. Blasting may occur in-stream at these waterbodies.

Four access road crossings would occur across one TSF, one HQ-CWF, one unnamed tributary to HQ-CWF, and one unclassified waterbody. Three additional HQ-CWF or unnamed tributary to HQ-CWF (Haymakers Run and unnamed tributary to Haymakers Run) would be within the property boundaries of the JB Tonkin Compressor Station in Pennsylvania.

Potential impacts on aquatic resources that could result from the crossing methods, blasting, water appropriation, and construction and use of access roads are discussed in section 4.6.4.

4.6.2 Aquatic Resources of Special Concern

Atlantic and DETI consulted the FWS, National Marine Fisheries Service (NMFS), FS, PAFBC, WVDNR, VDGIF, and NCWRC to identify waterbodies that contain federal or state-listed endangered, threatened, or proposed species, as well as FS-managed species; waterbodies are included in special state fishery management regulations; or waterbodies with significant economic value resulting from the presence of EFH, fish stocking programs, or commercial harvesting. Fisheries of special concern crossed by ACP and SHP are described below. Threatened and endangered species are discussed in section 4.7.1, FS-managed species are discussed in section 4.7.3, and state-listed and sensitive species are discussed in section 4.7.4.

4.6.2.1 West Virginia

Threatened and Endangered Resources

The following provides a summary of a subset of the rare, threatened, and endangered resources with the potential to occur in the ACP and SHP project areas in West Virginia. Additional information on these species, and descriptions of other ESA-listed, proposed, and under review aquatic species, FS-managed species, and SGCN that have the potential to occur in the ACP and SHP project areas in West Virginia are discussed in section 4.7 and appendices R and S.

<u>Brook Trout</u>

In addition to comments regarding ESA-listed species, the FWS West Virginia Field Office identified the brook trout as a species of concern due to declining populations associated with land conversions and habitat loss. Consequently, the FWS encouraged Atlantic and DETI to avoid and minimize impacts on streams that contain brook trout habitat through coordination with appropriate resource agencies. Brook trout is also a MNF MIS and a priority 1 SGCN in West Virginia (refer to table R-3 of appendix R and table S-1 of appendix S, respectively). There are 134 pipeline and access road crossings of designated brook trout and unnamed tributaries to brook trout streams, all known or with the potential to contain brook trout (see appendix K). SHP would not cross any waterbodies with the potential to contain brook trout.

In addition, the WVDNR has expressed concern with Atlantic's proposed construction activities at Big Spring Fork. Big Spring Fork is in the headwaters of Elk River. This system provides nursery waters for reproducing populations of brook, brown, and rainbow trout. It also supports the highest biodiversity of fish in West Virginia. The WVDNR indicates that due to the shallow karst topography of the region, Big Spring Fork will seasonally have multiple sinks and rises or reoccurrences of surface flow. Based on recent studies, the pH levels and fecal coliform levels in Big Spring Fork exceed criterion, and sediment loads are high in portions (Hansen and Boettner, 2008). Sources of pollution include second-home construction sites, landowner riparian disturbances, new impervious surfaces, logging operations, and farms (Hansen et al., 2011). In addition, based on recent macroinvertebrate and habitat studies, Big Spring Fork may be becoming less biologically healthy (Hansen and Boettner, 2008). Additional pollutant loads and flow increases to this already comprised system could further reduce aquatic invertebrate populations, and threaten trout and other aquatic species (Hansen et al., 2011).

Atlantic proposes to cross Big Spring Fork using a dry crossing technique with the pipeline (AP-1 MP 69.2), and proposes two permanent access roads in proximity to the pipeline crossing location (AP-1 MPs 69.1 and 69.3). In addition, Atlantic would cross two unnamed tributaries to the Big Spring Fork; one permanent access road crossing (AP-1 MP 68.9), and one pipeline crossing using a dry crossing technique (AP-1 MP 70.8). Atlantic would also conduct in-stream blasting at AP-1 MPs 69.2 and 70.8. Atlantic has committed to the adhering to the trout TOYR of September 15 to March 31 for all in-stream activities at Big Spring Fork and all other designated trout and unnamed tributaries to trout waters (see appendix K).

In response to WVDNR concerns and our recommendation in the draft EIS, Atlantic would no longer use the Big Spring Fork or the two unnamed tributaries for the withdrawal of 2.6 million gallons of water to support hydrostatic testing.

Candy Darter

The candy darter is not currently listed under the ESA. It was petitioned for listing in April 2010; the FWS determined the petition had substantial information and may be warranted for listing, and initiated a status review in September 2011 (see section 4.7.1.12). The candy darter is also an MNF RFSS and priority 1 SGCN in West Virginia (refer to table R-1 of appendix R and table S-1 of appendix S, respectively). This species currently has the potential to occur in Pocahontas County, West Virginia within the ACP project area (WVDNR, 2017). The species is endemic to the New River drainage in Virginia and West Virginia. The candy darter can be found in the upstream reaches of the mainstem of the Greenbrier River and its tributaries and has recently been documented in Knapp and Sitlington creeks. NHI data indicate one known occurrence of the candy darter in Knapp Creek about 1.5 miles south of an ACP access road and adjacent to a proposed contractor yard at AP-1 MP 81.0.

The FWS did not recommend surveys for the candy darter. Based on documented occurrence information and Atlantic's habitat assessment, we are recommending in section 4.7.1.12 and appendix K that if this species is proposed or listed during the life of the project, Atlantic should assume presence of the candy darter within Knapp Creek, Clover Creek, Glade Run, Thomas Creek, and the Greenbrier River, and apply the FWS' enhanced conservation measures for aquatic species outlined in section 4.7.1 to these waterbodies and any perennial tributaries within 1 mile of these crossing locations to minimize impacts on this species.

Freshwater Mussels

All mussel species are protected in the State of West Virginia under West Virginia §20-2-4 and CSR 58-60-5.11 by the WVDNR. If impacts cannot be avoided, all streams known to harbor mussels must be surveyed, and if mussels are present, they must be relocated prior to disturbance. Atlantic and DETI performed mussel surveys according to the *West Virginia Mussel Survey Protocol* (Clayton et al., 2016). Relocation efforts would proceed according to these guidelines upon authorization from the WVDNR.

Per FWS and WVDNR correspondence, Atlantic and DETI have assumed presence of freshwater mussel species at West Fork River and Hacker's Creek crossed by ACP; and McElroy Creek crossed by SHP. Both McElroy Creek and Hacker's Creek are classified as endangered mussel streams by the WVDNR and the FWS. During 2015 and 2016 surveys, Atlantic and DETI observed creeper, fatmucket, Wabash pigtoe, plain pocketbook, fluted shell, three ridge, and spike mussels (dead shells or alive) at two waterbodies crossed by ACP and at two crossing locations at two waterbodies crossed by SHP. These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information. Impacts on West Virginia mussel species are further discussed in section 4.7.4 and table S-1 of appendix S. No ESA-listed or under review mussel species were documented during surveys; however, historic data indicate the presence of the ESA-listed or under review mussels within the West Fork River, Hacker's Creek, and McElroy Creek (see section 4.7.1.15 and table S-1 of appendix S). We have recommended in section 4.7.1 and appendix K that Atlantic and DETI implement the FWS' enhanced conservation measures at these waterbodies and their perennial tributaries within 1 mile of project activity.

4.6.2.2 Virginia

The following provides a summary of a subset of the rare, threatened and endangered resources with the potential to occur in the ACP project area in Virginia. Additional information on these species, and descriptions of other ESA-listed, proposed, and under review aquatic species, FS-managed species, and state-listed species and SGCN that have the potential to occur in the ACP project area in Virginia are discussed in section 4.7 and appendices R and S.

Hatcheries

The VDGIF operates nine fish cultural stations around the Commonwealth. These are categorized as either "rearing stations" or "hatcheries." Four stations are coolwater and warmwater facilities that hatch and rear species like muskellunge, northern pike, striped bass, walleyes, catfish, largemouth bass, bluegill, and redear sunfish. Five stations are coldwater facilities engaged entirely in trout production, from hatching to raising to stocking sizes. The Coursey Springs State Fish Hatchery is adjacent to the Cowpasture River in Bath County, approximately 3.0 miles from the proposed AP-1 route. The Montebello Fish Cultural Station, a small trout rearing facility, is located approximately 9.5 miles southwest of the proposed AP-1 route in Nelson County. No other stations are in the same counties or cities crossed by ACP.

Anadromous Fish Use Areas

The Fisheries Division of the VDGIF identifies Anadromous Fish Use Areas, which are stream reaches that are confirmed or potential migration pathways, spawning grounds, or nursery areas for anadromous fish. There are 15 crossing locations of waterbodies that are confirmed to support anadromous fish use areas, and 69 crossings of unnamed tributaries to anadromous fish use areas by ACP in Virginia (see appendix K). The NMFS Northeast Regional Office recommended avoidance of impacts on anadromous fish populations in Virginia (NMFS, 2014a). NMFS specifically identified the South Branch Elizabeth River, James River, and Nottoway River as designated confirmed anadromous fish use areas by the VDGIF. In addition, VDGIF identified the Nansemond River in the City of Suffolk as Potential Anadromous Fish Use Areas; and the WERMS identified the James River as a Potential Anadromous Fish Use Area with a confirmed TOYR for anadromous fish (see appendix K). Anadromous fish in Virginia include Atlantic sturgeon (see below and section 4.7.1.8), shortnose sturgeon (section 4.7.1.9), alewife, blueback herring, American shad, hickory shad, striped bass, and some populations of yellow perch.

The James River (AP-1 MP 184.7), Mayo Creek (AP-1 MP 184.5 [as part of the James River HDD]), one of the Nottoway River crossings (AP-3 MP 32.6), Blackwater River (AP-3 MP 38.6), Western Branch Nansemond River (AP-3 MP 63.6), Nansemond River (AP-3 MP, 64.4), and South Branch Elizabeth River (AP-3 MP 81.8) are currently proposed to be crossed using the HDD method. Atlantic currently proposes the cofferdam method at the crossing of the Nottoway River at AP-1 MP 260.7; the anadromous fish use area stops downstream of the Nottoway River at this crossing location, and at the Meherrin River (AP-1 MP 286.3), for more than 4.5 and 2.3 miles, respectively. The other anadromous fish use area crossings consist of four crossings of Fountains Creek (AP-1, two crossings at MP 299.4, and two crossings at MP 299.6), and one crossing of the Meherrin River (AP-3 MP 12.4) (see appendix K). The VDGIF recommends avoidance of in-stream work in anadromous fish use waters and their tributaries generally from February 15 through June 30, with some exceptions (VDGIF, 2016a); the recommended TOYR for the South Branch Elizabeth River is February 1 to June 30. Based on consultations with the VDGIF and recommendations made in the draft EIS, the Master Waterbody Crossing Table filed March 24, 2017 (see appendix K) was updated to include anadromous fish use TOYR of March 15 to June 30 for the James River and its tributaries above Bosher Dam. Atlantic has committed to adhering to the TOYR for all in-stream activities.

Atlantic proposes to withdraw water from the James River at MP 184.7 and Blackwater River at MP 38.6. Based on the information provided in appendix K for the crossing of the James River, Atlantic proposes to withdraw a total of 10.2 million gallons from the James River to support HDDs and hydrostatic testing. Atlantic would withdraw water outside of the VDGIF anadromous fish TOYR for these waterbodies. In addition, we recommend in section 4.7.1 that Atlantic implement the FWS' enhanced conservation measures for ESA sensitive waterbodies at the James River, which would include:

- use of 1 mm or smaller screens to minimize impingement/entrainment of mussel host fish species and ESA-listed, proposed and under review species;
- limit water withdrawal to not exceed 10 percent of instantaneous flow;
- ensure that intake velocity does not exceed 0.25 f/s;
- use of floating intake structures to avoid impacts on the stream bed; and
- implementation of TOYR.

Rare, Threatened, and Endangered Species Waters

Stream Conservation Units

SCUs represent key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support. SCUs identify stream reaches that contain aquatic natural heritage resources, including upstream and downstream buffers and tributaries associated with these reaches (VDCR, 2016a). ACP would cross three SCUs in Virginia including the Nottoway River-Fort Pickett SCU, the Nottoway River-Sturgeon Creek/Hardwood Creek SCU, and the Nottoway River-Monroe Bridge SCU. The natural heritage resources of concern at these three SCUs include various freshwater mussel species (i.e., yellow lance, Atlantic pigtoe, yellow lampmussel, eastern lampmussel; Roanoke logperch; and Chowanoke crayfish). Laura's clubtail dragonfly is also know from the Nottoway River-Fort Pickett SCU, which also has a freshwater mussel concentration area. Construction activities would impact approximately 0.1 acre of the Nottoway River-Fort Pickett SCU, less than 0.1 acre of the Nottoway River-Sturgeon Creek/Hardwood Creek SCU, and less than 0.1 acre of the Nottoway River-Monroe Bridge SCU.

Atlantic and Shortnose Sturgeon

Based on consultation with the Northeast Region of NMFS, Atlantic and shortnose sturgeons, federally listed species, may be present within the City of Chesapeake, Virginia (see sections 4.7.1.8 and 4.7.1.9). The proposed AP-3 lateral crosses the South Branch Elizabeth River (MP 81.8), which may contain foraging adult and subadult Atlantic sturgeon. The species also occurs in the James River, which is crossed by the AP-1 route in Nelson and Buckingham Counties; however, the crossing is upstream of the Bosher Dam and there are no records of Atlantic sturgeon using the fish passage on the dam and spawning is not known to occur that far upriver.

Atlantic has not completed a habitat assessment or occupancy surveys for the Atlantic or shortnose sturgeon; Atlantic has assumed these species would be present during construction and has developed measures to minimize impacts. The South Branch Elizabeth River would be crossed by HDD. Based on FWS and our recommendations in the draft EIS, Atlantic would no longer withdraw water from the South Branch Elizabeth River. Additional information on these species is provided in sections 4.7.1.8 and 4.7.1.9.

Roanoke logperch

Atlantic has conducted habitat assessment surveys for the federally endangered Roanoke logperch, and will complete remaining surveys in 2017 (see section 4.7.1.10). Surveys have identified one waterbody crossed by ACP that has documented presence. This location is not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information. Atlantic has assumed presence at the Nottoway River, Sturgeon Creek, and Waqua Creek based on agency data; the VDGIF also recommend assumed presence at Butterwood Creek. The remaining surveys are anticipated to be completed in September 2017.

The waterbodies where Roanoke logperch have been documented and/or are assumed present would be crossed by either HDD or dry crossing methods. Due to the potential presence of Roanoke logperch, and potentially other ESA-listed or under review species, the FWS has requested that Atlantic consider utilizing the HDD method to cross Nottoway River (AP-1 MP 260.7). We recommend in section 4.7.10 and appendix K that Atlantic provide an hydrofracture potential analysis for this waterbody, and if the hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS to determine what additional conservation measures would be recommended at this crossing.

To avoid impacts on the Roanoke logperch, and other sensitive fish species, Atlantic developed the *Virginia Fish Relocation Plan* (see table 2.3.1-1). At every perennial and intermittent waterbody crossed by dry crossing methods along ACP in Virginia, all fish species that are trapped within the areas proposed for dewatering or in-stream work would be removed within 24 hours after the work area has been isolated. Removed species would then be documented and relocated to suitable habitat outside of the work area. Construction activities and fish relocation efforts would not be conducted during applicable TOYR for any protected species likely to be encountered at that location. A report of the fish removal and relocation effort would be provided to the FWS and VDGIF upon completion. Atlantic no longer proposes to withdraw water from any of the waterbodies where this species has been documented and/or is assumed present. Section 4.7.1.10 provides a discussion of potential impacts on the Roanoke logperch.

Orangefin madtom

The orangefin madtom is listed as threatened in Virginia (see section 4.7.4 and table S-2 of appendix S) and is a GWNF RFSS (see section 4.7.3 and table R-2 of appendix R). Orangefin madtom is found beneath shelter or larger gravel, rubble, or boulders in medium to large, cool to warm streams of moderate gradient and with swifter sections with little to no silt (VDGIF, 2016b). The native population of orange madtom occurs in the Roanoke River drainage, and an introduced population is found in the James River drainage. This species has been found in the South Fork Roanoke River watershed, Roanoke River above Salem, Craig Creek, Johns Creek, and Cowpasture River in Bath County (FS, 2014; FS, 2016c). Surveys for this species were conducted on the GWNF, but no madtom were observed.

To avoid impacts on the orangefin madtom, and other sensitive fish species, Atlantic developed the *Virginia Fish Relocation Plan* (see table 2.3.1-1). At every perennial and intermittent waterbody crossing along ACP in Virginia, all fish species that are trapped within the areas proposed for dewatering or in-stream work would be removed within 24 hours after the work area has been isolated. Removed species would then be documented and relocated to suitable habitat outside of the work area. A report of the fish removal and relocation effort would be provided to the FWS, GWNF, and VDGIF upon completion. Because only the introduced population of orange madtom may be affected by ACP, the VDGIF TOYR (March 15-May 31) would not apply (VDGIF, 2016a).

Freshwater Mussels

The FWS Virginia Field Office and VDGIF have developed *Freshwater Mussel Guidelines* (FWS and VDGIF, 2015a) for Virginia outlining the mussel survey and relocation methodology for federal and state-listed and non-listed species. If impacts cannot be avoided, all streams that may contain suitable mussel habitat or that are known to harbor mussels would be surveyed; the type of assessment or survey would be dependent upon the scope of the project, potential impacts, and known species distribution. In waterbodies where mussels are present, Atlantic would be required to prepare and submit a mussel relocation plan to the FWS and VDGIF for comment and approval prior to construction. The recommended time of year for mussel surveys and relocations is between April 1 and October 31. Additional TOYR may apply for construction and relocation efforts as directed by the VDGIF (VDGIF, 2016b). Based on FWS, VDGIF, and VDCR correspondence, Atlantic has assumed presence of ESA-listed or under review freshwater mussel species at 15 waterbodies identified in appendix K. Atlantic conducted surveys in 2015 and 2016 in waterbodies along the route with the potential to support freshwater mussel species, and identified non-ESA- or state-listed mussels at 16 waterbody crossings. Surveys identified the following non-listed and non-SGCN species: triangle floater, box spike, creeper, tidewater mucket, eastern elliptio, northern lance, Carolina slabshell, and variable spike. Atlantic also identified the following Virginia SGCN species: paper pondshell, eastern lampmussel, and yellow lampmussel; and one state-listed species, the Atlantic pigtoe, which is also under review for listing by the FWS, was identified at two waterbody crossing locations (see section 4.7.1.15 and table S-2 of appendix S). These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information.

As indicated above, Atlantic has committed to adhering to the applicable VDGIF TOYR (VDGIF, 2016a) for all in-stream activities in waterbodies where presence was documented during surveys or assumed based on agency data; these TOYR are reflected by waterbody in appendix K. We have recommended additional TOYR based on survey results and/or historic data per waterbody in appendix K. We recommend in section 4.7.1.10 that a hydrofracture potential analysis be conducted for Nottoway River (AP-1 MP 267.0) due to the potential presence of Roanoke logperch; however, there is also the potential presence of ESA-listed, proposed, and/or under review mussel species at these waterbodies, which further supports our recommendation for HDDs at these crossing locations, if feasible. Impacts on Virginia mussel species are further discussed in section 4.7.4 and table S-2 of appendix S.

4.6.2.3 North Carolina

Anadromous Fish Spawning Areas

The NCDMF and NCWRC have designated waterbodies as AFSA for the distribution of anadromous fishes in the state. Anadromous fish of North Carolina include Atlantic sturgeon (see below and section 4.7.1.8), short-nosed sturgeon (see section 4.7.1.9), blueback herring, striped bass, American shad, hickory shad, and alewife.

The NMFS Southeast Regional Office recommended avoidance of impacts on anadromous fish populations in North Carolina (NMFS, 2014a), including known occurrences of diadromous fishes, such as the American shad, alewife, blueback herring, and striped bass along the proposed AP-2 route in the Roanoke (MP 9.9), Neuse (MP 98.5) and Cape Fear Rivers (MP 154.2).

AFSA were identified using *A Reference Guide to the Distribution of Anadromous Fishes in North Carolina Rivers* (NMFS, 2010a). The Roanoke River, Fishing Creek, Swift Creek, Little River, and Cape Fear River, identified as supporting AFSA, would be crossed by HDDs. The Neuse River would be crossed by the cofferdam method (see appendix K). Based on the Neuse River's potential to support ESA-listed and under review species and state-listed species, we recommend in section 4.7.1.8 and appendix K that Atlantic provide a hydrofracture potential analysis for the Neuse River, and if the hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS to determine what additional conservation measures would be recommended at this crossing location.

Based on FWS and our recommendations in the draft EIS, Atlantic no longer proposes to withdraw water at any of the waterbodies where Atlantic sturgeon is assumed present. Atlantic would adhere to the February 1 to June 30 TOYR in the Neuse River. Based on comments from the NCWRC on the draft EIS, the Roanoke River, Neuse River, and Cape Fear River are also PNAs in inland fishing waters with a corresponding TOYR of February 15 to September 30. We recommend in appendix K that Atlantic apply this TOYR to these waterbodies.

Sensitive Aquatic Species Endangered Habitat

The following provides a summary of a subset of the rare, threatened, and endangered resources with the potential to occur in the ACP project area in North Carolina. Additional information on these species, and descriptions of other ESA-listed, proposed, and under review aquatic species, and state-listed species and SGCN that have the potential to occur in the ACP project area in North Carolina are discussed in section 4.7 and table S-3 of appendix S.

<u>Neuse River Waterdog</u>

The Neuse River waterdog is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and listing may be warranted (see section 4.7.1.7). It is currently identified as a species of concern in North Carolina (see section 4.7.4 and table S-3 of appendix S). The Neuse River waterdog is found within the ACP project area in the Neuse and Tar-Pamlico drainage basin in Halifax, Nash, Wilson, and Johnston Counties, North Carolina. Atlantic evaluated perennial streams in the Tar and Neuse River basins in 2015 and 2016. Presence/absence surveys were conducted in areas identified as containing suitable habitat for the species. Suitable habitat was identified at 19 waterbody crossing locations, and presence was confirmed at 4 waterbody crossing locations. A total of 42 Neuse River waterdogs were captured at the 4 sites. These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information. Additional surveys are pending and are anticipated to be completed in 2017.

Waterbodies where Neuse River waterdogs were documented during 2016 surveys would be crossed using the HDD technique to avoid impacts on this species; however, 12 waterbodies with suitable habitat for this species would be crossed using the wet open-cut method, and the remaining 2 waterbodies would be crossed using a dry crossing technique. Atlantic also committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from the waterbody prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Atlantic would monitor water withdrawals proposed at the Tar River and Contentnea Creek during appropriation to ensure water would not exceed 10 percent of the waterbody's discharge. Sections 4.7.1.7 and 4.7.4.3 and table S-3 of appendix S provide additional discussion of this species.

Atlantic and Shortnose Sturgeon

Based on consultation with the Southeast Region of NMFS, federally listed Atlantic sturgeon have been documented, and shortnose sturgeon have the potential to occur in the Roanoke River, which is crossed by the proposed AP-2 approximately 7 river miles downstream from Roanoke Rapids, near Weldon, North Carolina at the Northampton and Halifax County line. There are North Carolina state records for Atlantic sturgeon in the Roanoke River, and fall spawning has been documented in the river near Weldon. The Roanoke River crossing at AP-2 MP 9.9 crosses the Carolina Unit 1/Roanoke Unit of the Carolina distinct population segment (DPS) Proposed Critical Habitat (PCH). The Roanoke River crossing is expected to support spawning Atlantic sturgeon during spring and early summer spawning. The Status Review also identifies occurrences of Atlantic sturgeon in the Cape Fear, Tar, and Neuse Rivers, each of which is crossed by AP-2. The lock and dam #2 on the Cape Fear River likely prohibits sturgeon from traveling upstream to the proposed crossing location in Cumberland County. During the public comment period for Atlantic sturgeon PCH, NMFS received comments to move the proposed boundary of Atlantic sturgeon PCH within the Cape Fear River further upstream; NMFS' final determination on this suggested revision is anticipated July 18, 2017 (NMFS, 2017b). Sturgeon likely cannot travel past the waterfall at Rocky Mount to reach the proposed crossing of the Tar River in Nash County. ACP crosses the Carolina Unit 3/Neuse River Carolina DPS PCH at AP-2 MP 98.5.

Atlantic has not completed a habitat assessment or occupancy surveys for the Atlantic or shortnose sturgeons; Atlantic would assume these species would be present in the Roanoke and Neuse Rivers during construction and would develop measures to minimize impacts. The Roanoke and Cape Fear Rivers would be crossed using the HDD method. Atlantic would construct the crossing of the Neuse River outside of the February 1 to June 30 sturgeon moratorium to minimize impacts on the sturgeon species. In addition, in response to FWS and our recommendations in the draft EIS, Atlantic would no longer withdraw water in waterbodies where sturgeon are assumed present. Due to the potential presence of other ESA-listed or under review species, the FWS has requested that Atlantic consider utilizing the HDD method to cross the Neuse River. We recommend in section 4.7.1.8 and appendix K that Atlantic provide a hydrofracture potential analysis for this waterbody, and if the hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS to determine what additional conservation measures would be recommended at these crossings.

Additional information on these species is provided in sections 4.7.1.8 and 4.7.1.9.

Carolina Madtom

The Carolina madtom is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and may be warranted for listing (see section 4.7.1.11). The Carolina madtom is currently state-listed as threatened in North Carolina (see table S-3 of appendix S). Per FWS correspondence, this species is known from the Tar River, Fishing Creek, Little River, and Contentnea Creek (FWS, 2015b), and the FWS indicated there is potential habitat for this species in the Neuse and Tar River watersheds in Halifax, Nash, Wilson, and Johnston Counties. Atlantic has assumed presence of Carolina madtom at Fishing Creek, Contentnea Creek, Tar River, and Neuse River, North Carolina based on agency data. Surveys have identified two waterbodies crossed by ACP that have documented presence. These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information. Additional habitat assessment surveys are pending. The FWS has indicated that the Carolina madtom has low detectability during individual surveys. We recommend in section 4.7.1.11 and appendix K that Atlantic assume presence of Carolina madtom where FWS reviewed survey results indicate suitable habitat and implement the conservation measures outlined below and in section 4.7.1.11.

Five of the six waterbodies with known or assumed presence of Carolina madtom would be crossed utilizing the HDD method. Atlantic has proposed utilizing the cofferdam method to cross the Neuse River where the Carolina madtom is assumed present. Due to the potential presence of Carolina madtom and other ESA-listed or under review species, FWS has requested that Atlantic consider utilizing the HDD method to cross the Neuse River. We recommend in section 4.7.1.8 and appendix K that Atlantic provide a hydrofracture potential analysis for this waterbody, and if the hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS to determine what additional conservation measures would be recommended at this crossing.

Dry and wet crossing methods are proposed for some of the waterbody crossing locations where there is Carolina madtom suitable habitat. Atlantic has committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Atlantic would monitor water withdrawals proposed at the Tar River and Contentnea Creek during appropriation to ensure water would not exceed 10 percent of the waterbody's discharge. Sections 4.7.1.11 and 4.7.4.3 and table S-3 of appendix S provide additional discussion of this species.

Chowanoke Crayfish

The Chowanoke crayfish is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and listing may be warranted (see section 4.7.1.14). It is currently identified as a species of concern in North Carolina (see table S-3 of appendix S). The species is found in Virginia and North Carolina in the Lower Roanoke, Nottoway, and Meherrin watersheds. In the ACP project area, suitable habitat may occur in the main stem Roanoke River (FWS, 2015b). Field surveys conducted in 2015 and 2016 in the Roanoke drainage did not identify the presence of Chowanoke crayfish in North Carolina; however, one waterbody crossing location was identified as having suitable habitat. Atlantic assumes presence for Chowanoke crayfish at the Roanoke River. Additional surveys are pending.

The Roanoke River (AP-2 MP 9.9), where Chowanoke crayfish is assumed present, would be crossed utilizing the HDD technique. The waterbody identified as having suitable habitat for the Chowanoke crayfish would be crossed using a dry crossing technique. Atlantic has committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts to rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Based on FWS and our recommendations in the draft EIS, water withdrawals are no longer proposed at the Roanoke River.

<u>Freshwater Mussels</u>

Based on FWS and NCWRC correspondence, freshwater mussel presence is assumed at Roanoke River, Fishing Creek, Swift Creek, Contentnea Creek, Tar River, Little River, Neuse River, and Cape Fear River. Atlantic conducted surveys in 2015 and 2016 in waterbodies along the route with the potential to support freshwater mussel species and identified mussels at 17 waterbody crossing locations. Surveys identified the following non-listed mussel species: eastern elliptio, box spike, paper pondshell, northern lance, variable spike, *Elliptio mediocris*, Atlantic spike, and Carolina slabshell. Surveys also identified the following state-listed species: triangle floater, Roanoke slabshell, yellow lampmussel, eastern lampmussel, creeper, and Carolina fatmucket. Atlantic pigtoe, a state-listed mussel that is currently under review for listing under ESA by FWS, was also identified at four waterbody crossings (see section 4.7.1.15 and table S-3 of appendix S). These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information.

State-listed mussel species were identified at five waterbodies that would be crossed by ACP; all but one of these locations would be crossed utilizing the HDD method. However, due to presence of other ESA-listed or under review species within this same waterbody, the FWS has requested that Atlantic consider utilizing the HDD method. We recommend in section 4.7.15 and appendix K that Atlantic provide a hydrofracture potential analysis for this waterbody, and if the hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS and NCWRC to determine what additional conservation measures would be recommended at this crossing location. Impacts on North Carolina state-listed and rare mussel species are further discussed in section 4.7.4.3 and table S-3 of appendix S.

Atlantic has also committed to implementing its *Freshwater Mussel Relocation Plan for ACP in North Carolina*. To reduce impacts on freshwater mussels, Atlantic would remove individuals from workspaces 6 months prior to in-stream construction activities. Atlantic submitted the *Freshwater Mussel Relocation Plan for ACP in North Carolina* to the FWS North Carolina Field Office and NCWRC on April 17, 2017, for review and concurrence. Atlantic will work with these agencies to address any comments and will submit a final plan when it is complete. Atlantic would monitor water withdrawals proposed at the Tar River and Contentnea Creek during appropriation to ensure water would not exceed 10 percent of the waterbody's discharge. Sections 4.7.1.15 and 4.7.4.3 and table S-3 of appendix S provide additional discussion of these species.

4.6.2.4 Pennsylvania

Based on consultations with the PAFBC, no sensitive waterbodies would be crossed by SHP. The three-ridge mussel (*Amblema plicata*), a Pennsylvania special concern species, has the potential to occur near the Crayne Compressor Station. To minimize potential indirect impacts mussel species, DETI would restrict all chemical storage, including fuel storage for equipment refueling, to at least 100 feet from waterways, and would implement the sediment and erosion control measures described in DETI's construction and restoration plans (see table 2.3.1-1).

4.6.3 Essential Fish Habitat

The MSA was established to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity (NMFS, 2016a). Under the MSA, a federal agency is required to consult with NMFS if the proposed action would adversely affect EFH. Adverse effects include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to species and their habitat, and other ecosystem components, or reduction of the quality and quantity of EFH. Adverse effects may result from actions within or outside EFH. If the federal agency determines that an action will not adversely affect EFH, no consultation is required (NMFS, 2016b). Based on the current information provided by Atlantic and DETI and summarized below, we determined that there would be no adverse impacts on EFH and no further consultation is required.

The NMFS Southeast Regional Office did not identify any designated EFH within the ACP project area in North Carolina. The NMFS Northeast Regional Office identified two areas designated as EFH in the South Branch Elizabeth River (AP-3 MP 81.8) within the City of Chesapeake, Virginia, and the Nansemond River (AP-3 MP 64.4) in the City of Suffolk, Virginia. This review identified 14 managed species in 5 habitat groups that could occur in the ACP project area. Table 4.6.3-1 provides a summary of this habitat.

Atlantic is planning to use the HDD method for the crossing of the South Branch Elizabeth River and the Nansemond River and associated tidal wetlands, which would avoid direct impacts on the waterbodies and wetlands. However, impacts on EFH could result in the event of an inadvertent return of drilling fluid, inadvertent hazardous material spills, run-off of sediment from construction areas into the waterbody, or water withdrawals for hydrostatic testing and mixing drilling fluid.

To minimize potential impacts related to an inadvertent release of drilling fluid, or hazardous materials, or spills, Atlantic would implement the measures included in its *HDD Plan* (see appendix H) and *SPCC Plan* (see table 2.3.1-1). If drilling fluid were released into the river or wetlands during an inadvertent release, the volume is expected to be relatively minimal. In addition, both the South Branch Elizabeth River and Nansemond River are high volume rivers with high waterway traffic, high turbidity, and presence of existing pollutants, and an inadvertent release into these waters would be minimal and temporary and would not be anticipated to result in a significant impact on EFH.

Based on FWS and our recommendations in the draft EIS, Atlantic no longer proposes to withdraw water from the South Branch Elizabeth River or the Nansemond River; therefore, impacts on EFH due to water withdrawal are not anticipated. Potential impacts on EFH and managed fish resources associated with water discharges include erosion or scour, and potential sedimentation transport to waterbodies resulting in increased turbidity. Once hydrostatic testing is complete, hydrostatic test waters would be discharged to well-vegetated upland areas. Atlantic would also regulate discharge rates to prevent scour and erosion in uplands. After completion of the HDD operations, the recovered drilling mud would be recycled or disposed of at an approved upland location or disposal facility.

TABLE 4.6.3-1

Summary of Essential Fish Habitat and General Habitat Parameters for the Atlantic Coast Pipeline [a]

Essential Fish Habitat Species	Life Stage [b]	Location [c]	Essential Fish Habitat Characteristics [d]
New England Species			
Windowpane flounder *(Scophthalmus aquosus)*	Juvenile	South Branch Elizabeth River, Nansemond River	Mud/fine sand bottom habitats; <25 °C; 5.5 to 36 ppt; 1 to 100 m
	Adult	South Branch Elizabeth River, Nansemond River	Mud/fine sand bottom habitats; <26.8 °C; 5.5 to 36 ppt; 1 to 75 m
Clearnose skate *(Raja eglanteria)*	Juvenile	South Branch Elizabeth River, Nansemond River	Soft, gravel, or rock bottom habitats; 9 to 21 °C; 1 to 500 m
	Adult	South Branch Elizabeth River, Nansemond River	Soft, gravel, or rock bottom habitats; 9 to 21 °C; 1 to 400 m
Little skate *(Leucoraja erinacea)*	Juvenile	South Branch Elizabeth River, Nansemond River	Sand, gravel, or mud bottom habitats; 4 to 15 °C; 1 to 137 m
	Adult	South Branch Elizabeth River, Nansemond River	Sand, gravel, or mud bottom habitats; 2 to 15 °C; 1 to 137 m
Winter skate *(Leucoraja ocellata)*	Juvenile	South Branch Elizabeth River, Nansemond River	Sand, gravel, or mud bottom habitats; 4 to 16 °C; 1 to 40 0m
	Adult	South Branch Elizabeth River, Nansemond River	Sand, gravel, or mud bottom habitats; 5 to 15 °C; 1 to 371 m
Mid-Atlantic Species			
Bluefish *(Pomatomus saltatrix)*	Juvenile	South Branch Elizabeth River, Nansemond River	Mixing/seawater portions of estuaries; 19 to 24°C; 23 to 36 ppt
	Adult	South Branch Elizabeth River, Nansemond River	Estuarine waters; 14 to 16°C; >25 ppt
Atlantic butterfish *(Peprilus triacanthus)*	Egg	South Branch Elizabeth River, Nansemond River	Pelagic waters; mixing portions of estuaries; 11 to 17 °C; 25 to 33 ppt; 10 to 1,829 m
	Larvae	South Branch Elizabeth River, Nansemond River	Pelagic waters; mixing portions of estuaries; 9 to 19 °C; 6.4 to 37 ppt; 10 to 1,829 m
	Juvenile	South Branch Elizabeth River, Nansemond River	Pelagic waters; mixing/seawater portions of estuaries; 3 to 28 °C; 3 to 37 ppt; 10 to 365 m
	Adult	South Branch Elizabeth River, Nansemond River	Pelagic waters; mixing/seawater portions of estuaries; 3 to 28 °C; 4 to 26 ppt; 10 to 365 m
Summer flounder *(Paralicthys dentatus)*	Larvae	South Branch Elizabeth River, Nansemond River	Pelagic shelf waters; mixing/seawater portions of estuaries; 9 to 12 °C; 23 to 33 ppt; 10 to 70 m; nearshore
	Juvenile	South Branch Elizabeth River, Nansemond River	Demersal; mixing/seawater portions of estuaries; salt marsh creeks/ seagrass beds/mudflats/open bays; >11 °C; 10 to 30 ppt; 0.5 to 5 m in estuary

TABLE 4.6.3-1 (cont'd)

Summary of Essential Fish Habitat and General Habitat Parameters for the Atlantic Coast Pipeline [a]

Essential Fish Habitat Species	Life Stage [b]	Location [c]	Essential Fish Habitat Characteristics [d]
	Adult	South Branch Elizabeth River, Nansemond River	Demersal waters; shallow mixing/seawater portions of estuaries; shallow coastal waters; fresh water; 0 to 25 m
South Atlantic Species			
Red drum *(Sciaenops occelatus)*	Egg	South Branch Elizabeth River, Nansemond River	Not described
	Larvae	South Branch Elizabeth River, Nansemond River	Estuarine wetlands; flooded salt marshes and brackish marsh; tidal creeks, mangrove fringe, seagrass beds; 2 to 33 °C; low salinity; <50 m
	Juvenile	South Branch Elizabeth River, Nansemond River	Shallow and deeper portions of estuaries associated with river mouths; oyster bars; and front beaches; 2 to 33 °C; 20 to 40 ppt; <50 m.
	Adult	South Branch Elizabeth River, Nansemond River	Inlets, shoals, and capes along coast, sallow bay bottoms or oyster reef substrate, and nearshore artificial reefs; 2 to 33 °C; low salinity; <50 m
Coastal migratory Pelagics			
Black sea bass *(Centropristis striata)*	Juvenile	South Branch Elizabeth River, Nansemond River	Demersal waters; mixing/seawater portions of estuaries; rough bottom; shellfish/eelgrass beds; structures >6 °C; >18 ppt; 1 to 38 m
	Adult	South Branch Elizabeth River, Nansemond River	Demersal waters; mixing/seawater portions of estuaries; structured habitat; >6 °C; >20 ppt; 20 to 50 m
King mackerel *(Scomberomorus cavalla)*	Egg	South Branch Elizabeth River, Nansemond River	Pelagic waters; > 17 °C; 32 to 36 ppt
	Larvae	South Branch Elizabeth River, Nansemond River	Pelagic waters; 26-31 °C; 26 to 37 ppt
	Juvenile	South Branch Elizabeth River, Nansemond River	Pelagic waters; > 20 °C
	Adult	South Branch Elizabeth River, Nansemond River	Pelagic waters; > 20 °C
Spanish mackerel *(Scomberomorus maculatus)*	Egg	South Branch Elizabeth River, Nansemond River	Pelagic waters; > 17 °C; 32 to 36 ppt
	Larvae	South Branch Elizabeth River, Nansemond River	Pelagic waters; 19-30 °C; > 28 ppt
	Juvenile	South Branch Elizabeth River, Nansemond River	Estuaries; > 17 °C; 32 to 26 ppt
	Adult	South Branch Elizabeth River, Nansemond River	Estuaries; pelagic waters; 21-31 °C; 32 to 36 ppt
Cobia *(Rachycentron canadum)*	Egg	South Branch Elizabeth River, Nansemond River	Offshore
	Larvae	South Branch Elizabeth River, Nansemond River	Offshore
	Juvenile	South Branch Elizabeth River, Nansemond River	Coastal waters; high salinity

TABLE 4.6.3-1 (cont'd)

Summary of Essential Fish Habitat and General Habitat Parameters for the Atlantic Coast Pipeline [a]

Essential Fish Habitat Species	Life Stage [b]	Location [c]	Essential Fish Habitat Characteristics [d]
	Adult	South Branch Elizabeth River, Nansemond River	Estuaries; mud, sand, coral reef substrates
Highly migratory Species			
Sandbar shark *(Carcharhinus plumbeus)*	Neonates	South Branch Elizabeth River, Nansemond River	Shallow coastal waters; < 25 m (Habitat Area of Particular Concern, South Branch Elizabeth River)
	Juvenile	South Branch Elizabeth River, Nansemond River	Shallow coastal waters; < 25 m (Habitat Area of Particular Concern, South Branch Elizabeth River)
	Adult	South Branch Elizabeth River, Nansemond River	Shallow coastal waters; < 50 m (Habitat Area of Particular Concern, South Branch Elizabeth River)
Dusky shark *(Carcharhinus obscures)*	Neonates	South Branch Elizabeth River, Nansemond River	Shallow coastal waters, inlets, estuaries; < 25 m

[a] Based on 10-minute by 10-minute latitudinal/longitudinal designated EFH quadrants identified through consultation with NMFS in the Northeast Region.
[b] Designated EFH along ACP only occurs in areas where EFH characteristics are present.
[c] Nansemond River refers to the Nansemond River, Western Branch Nansemond River, and associated tidal wetlands.
[d] °C = degrees Celsius; m = meters; ppt = parts per thousand
Sources: NMFS, 2003, 2014b, 2014c, 2015a.

Atlantic would implement the measures described above, in addition to the FERC *Plan* and *Procedures* (see table 2.3.1-1), to avoid or minimize impacts on managed fish species and their prey due to entrainment or impingement, chemical exposure, or turbid water. Therefore, potential effects on EFH from ACP are not anticipated to be significant.

4.6.4 General Impacts and Mitigation

This section describes general impacts and measures that would be implemented to minimize impacts on fisheries and aquatic resources in the project area, including EFH and other fisheries of special concern. Specific effects on EFH are discussed in section 4.6.3. Specific effects on ESA-listed, proposed or under review species, FS-managed species, or state-listed species or species of concern are described in section 4.7. Construction and modifications to existing aboveground facilities are not expected to result in significant effects to any waterbodies or fisheries. Thus, the following section focuses on activities associated with the construction of the proposed pipeline facilities and access road construction and use. Additional details regarding waterbody crossing methods are provided in sections 2.3.3 and 4.3.2.6, and the proposed crossing method for each waterbody potentially affected by ACP and SHP is provided in appendix K.

Sediment and Turbidity

Increased sedimentation and turbidity resulting from in-stream and adjacent construction activities would displace and impact fisheries and aquatic resources. The EPA considers both suspended and bedded sediments and their potential impacts to aquatic life for water quality standards. Suspended sediments may adversely affect submerged macrophytes by reducing light available for photosynthesis by plants and visual capacity for animals, while bedded sediments settle out on the bottom of the waterbody and smother spawning beds and other habitats. Sedimentation could smother fish eggs and other benthic biota and alter stream bottom characteristics, such as converting sand, gravel, or rock substrate to silt or mud. These habitat alterations could reduce juvenile fish survival, spawning habitat, and benthic community diversity and health. Increased turbidity could also temporarily reduce dissolved oxygen levels in the water column and reduce respiratory functions in stream biota. Turbid conditions could also reduce the ability for biota to find food sources or avoid prey, and cause physiological effects in fish, such as gill clogging. The extent of impacts from sedimentation and turbidity would depend on sediment loads, stream flows, stream bank and stream bed composition, sediment particle size, and the duration of the disturbances (EPA, 2003).

Of the 1,326 waterbody crossings associated with the ACP or SHP pipelines, 995 waterbodies would be crossed using a dry crossing technique (not including HDDs or conventional bores) (see appendix K). While several factors can influence the effectiveness of dry crossing techniques across waterbodies, if the crossings are properly installed and maintained during construction and restoration, the levels of sediment and turbidity produced are typically minor. Based on a literature assessment of magnitude and timing of suspended sediment produced from open-cut dry crossing methods (Reid and Anderson, 1999), the duration of increased sedimentation associated with construction across the waterbody is dependent on the size of the watercourse, flow volume, crossing technique, and sediment particle size; typically the greatest peaks in suspended sediment concentration are associated with trench excavation which would be mostly short-term (i.e., less than 1 to 4 days) and vary in distance downstream from the crossing location according to particle size (i.e., increased fines in the streambed up to 200 m downstream). The likely range of effects on aquatic resources in the project area can be approximated by applying this predicted suspended sediment to the Newcombe and Jensen model (Newcombe and Jensen, 1996). Results from this model suggest a very low probability of fish mortality from construction, with local crossing area impacts consisting of mostly sublethal effects (e.g., short-term physiological stress and reduction of feeding), and limited habitat degradation.

Open-cut construction would result in increased turbidity and sedimentation in the crossing vicinity, potentially decreasing the dissolved oxygen, thereby potentially suffocating the eggs and larvae of fish and invertebrates. Sedimentation could displace the more mobile species and potentially smother benthic invertebrates, decreasing prey availability for fish. These effects could degrade the quality of the habitat, making it unsuitable for spawning and rearing activities. Generally, the open-cut crossing method is the quickest way to cross a waterbody, which allows for some impacts to be very short in duration. Impacts from open-cut construction would be temporary and limited to the crossing location and areas immediately downstream. Short-term impacts would normally be limited to a few days, and generally no longer than 1 month after construction ends, depending on conditions at the crossing, the type and amount of suspended sediment, and other factors. However, Reid and Anderson (1999) reported longer term alterations to channel morphology at crossing locations, including increases in channel width, reduced water depth, and meanders 2 to 4 years after construction. BMPs would be utilized to attempt to minimize sedimentation in the stream during construction until revegetation is successful.

High and sustained levels of increased sediment may cause permanent alterations in invertebrate community structures, including diversity, density, biomass, growth, rates or reproduction, and mortality. Impacts on freshwater mussel species resulting from increased sedimentation is species-specific; some species can compensate for increased sedimentation by increasing filtration rates. Many endangered freshwater mussel species have evolved in fast flowing streams with historically low levels of suspended sediment and may not be able to compensate for increased sedimentation, which may result in reduced feeding, growth, and reproduction rates (EPA, 2003). Although freshwater mussels in the construction work area would be relocated by qualified biologists and in accordance with both West Virginia, Virginia, and North Carolina federal and state agency mussel protocols, downstream sessile species could be affected. Aquatic invertebrates, including insect larvae, would generally be unable to avoid work areas. However, these areas would rapidly recolonize as a result of upstream drift and new egg deposition from adults within days to months (Brooks and Boulton, 1991; Matthaei and Townsend, 2000).

Atlantic would reduce downstream sedimentation and turbidity, and subsequent impacts on aquatic biota in these waterbodies by conducting the crossings during low-flow periods within the applicable TOYR for protection of fisheries and species of special concern, and following the FERC *Plan* and *Procedures* (see section 2.3.1-1) relative to construction on the streambanks. Furthermore, for waterbodies with the potential for ESA-listed, proposed, or under review species, we recommend in section 4.7.1 and appendix K that Atlantic and DETI implement the FWS' enhanced conservation measures for ESA sensitive waterbodies described in section 4.7.1.

In addition to increased sedimentation and turbidity resulting from construction across waterbodies, the FWS and FS have expressed concern with sediment-laden discharge water from nearby access roads that could drain into waterbodies occupied by sensitive species and other aquatic biota. Atlantic and DETI would use existing public and private roads to gain access to the pipeline rights-of-way and aboveground facilities to the fullest extent possible, but would also construct and use new access roads where access is needed and roads do not currently exist. Approximately 81 percent of the proposed access roads are existing roads that can accommodate construction traffic without modification or improvement. Some access roads, however, are dirt or gravel roads that are not currently suitable for construction traffic. Where necessary, Atlantic and DETI would improve unsuitable dirt and gravel roads through widening and/or grading, installing or replacing culverts, or clearing overhanging vegetation or tree limbs; improvements will be based on need. Widening would generally involve increasing the width of the road up to 30 feet. After construction, Atlantic and DETI would remove access road improvements and restore improved roads to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place, or the roads would be utilized as operational access to the pipeline right-of-way or aboveground facilities.

Permanent access roads are proposed across 264 waterbodies on ACP, and there are an additional 10 temporary access road crossings. DETI has proposed permanent access roads across 62 waterbodies on SHP. As noted above, most of these access roads are existing public or private roads that may or may not require improvements. Although many of these access roads are existing, it is anticipated that there would be in increase in heavy vehicular and construction equipment traffic during construction that could increase erosion and sedimentation runoff from these roads.

Atlantic and DETI would mark approved access roads using temporary signs or flagging and the limits of approved disturbance on any access roads requiring widening. Atlantic and DETI would mark other environmentally sensitive areas (e.g., waterbodies, cultural resources, and sensitive species) where appropriate. Where improvements are needed, Atlantic and DETI would install erosion devices in accordance with federal and state permit requirements, and would maintain these devices through the completion of construction. In addition, where culverts require replacement, they would be sized to satisfy simulation design standards to accommodate the passage of aquatic organisms, flows, and other fluvially transported material. Many existing access roads are not designed to these standards so replacement of existing culverts would serve to improve movement of aquatic organisms. Atlantic and DETI have committed to the following additional measures at ESA sensitive waterbodies, as defined in section 4.7.1 and identified in appendix K:

- Atlantic and DETI would use compost filter socks at the edges of workspace and access roads within 300 feet of the ESA sensitive waterbodies. The sizing of the compost filter sock would be based on industry-accepted methodology and would typically consist of a single layer of 12-inch- or 18-inch-diameter compost filter sock. Where sizing calculations suggest use of large diameter compost filter sock, a triple stack of 18-inch-diameter compost filter sock would be used.

- Atlantic would utilize erosion and sediment control BMPs on access roads identified in the field as having significant erosion potential within 0.25 mile of ESA sensitive waterbodies (see appendix K). If an access road crosses a waterbody with potentially suitable habitat for ESA-listed, proposed, or under review species and the access road requires in-stream activities for improvements, Atlantic would conduct surveys prior to any project activities. If Atlantic and DETI document ESA-listed, proposed, or under review species in the waterbody during remaining surveys or construction, they would not use the access road unless in-stream activities could be avoided such as through use of an existing bridge.
- Atlantic and DETI would implement BIC Team incremental controls described in section 4.1.4.2 to mitigate erosion and sedimentation and slope instability concerns within steep slope areas (defined as slopes with a minimum length of 100 feet and including slopes of 30 percent or greater).

Atlantic is currently proposing three permanent access road crossings in waterbodies with the potential for ESA-listed mussel species on ACP (Hacker's Creek and Mill Creek), and DETI has proposed one access road crossing of McElroy Creek where the snuffbox mussel is assumed present. Further discussion on the impacts and conservation measures associated with these crossings are discussed in section 4.7.1.15. No other access roads are proposed across ESA-designated sensitive waterbodies; however, access roads are proposed at tributaries to ESA sensitive waterbodies where additional conservation measures, such as applicable TOYR and/or enhanced erosion control measures would apply (see appendix K). Access roads are also proposed across approximately 63 brook trout waters in West Virginia and 31 brook trout waterbodies in Virginia. Atlantic would implement the TOYR for any in-stream work associated with the access road crossing (September 15 through March 31 in West Virginia, and October 1 through March 31 in Virginia).

In addition, to runoff associated with access roads, runoff could also result from the construction workspace and discharge into adjacent waterbodies, thereby further increasing sedimentation and turbidity within the watershed. The FS requested that Atlantic prepare a Soil Erosion and Sedimentation Model Report assessing the extent of sedimentation that could occur within priority subwatersheds within the MNF and GWNF during construction. Generally, the model results indicate a substantial increase in soil loss relative to baseline rates for the first year of construction. Soil rates are predicted to be higher where there are steeper slopes and higher soil erodibility values. The model results indicate a decline in soil erosion with time as the construction workspace is restored and becomes revegetated. Although according to the model, the predicted soil erosion rates returned to baseline by the third year, some of the model results were skewed to present a best case scenario, and likely underestimate short-term and long-term sediment loads. See section 4.3.2.8 for a more thorough discussion on Sedimentation Analysis on NFS lands.

The potential for erosion and sedimentation from landslides and slope failures on steep slopes over the long term must also be recognized (see section 4.1.4.2). Long-term impacts related to slope instability adjacent to waterbodies at the locations identified in section 4.1.4.2 has the potential to severely impact water quality, stream channel geometry, and subsequently aquatic life. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted.

In addition to implementing the FERC *Plan* and *Procedures*, Atlantic and DETI would minimize erosion and sedimentation from the construction workspace and access roads by implementing the WVDEP's *Erosion and Sediment Control Best Management Practice Manual* (WVDEP, 2006a), the Virginia *Erosion and Sediment Control Handbook* (VDEQ, 1992), the Pennsylvania *Erosion and Sediment Pollution Control Program Manual* (PDEP, 2012), and the North Carolina *Erosion and Sediment Control*

Planning and Design Manual (North Carolina Sedimentation Control Commission et al., 2013). Atlantic and DETI would construct their projects in accordance with state/commonwealth Construction Stormwater NPDES permits, which regulate the discharge of stormwater generated from construction activities. A condition of these permits would be to develop and implement a project-specific *SWPPP* or *Erosion and Sediment Control Plan*. The *SWPPP* must assess the project area and select appropriate erosion and sediment control BMPs. Once installed, BMPs must be periodically inspected and repaired per each State's/Commonwealth's requirements. Inspections are normally required until the project has reached final stabilization and all temporary erosion and sediment BMPs have been removed. Where required by the FERC *Plan* and *Procedures*, permanent erosion controls, such as slope breakers, would be installed to aid long-term stabilization along with the restored vegetation.

As indicated above, Atlantic and DETI would also use compost filter socks at the edges of workspaces and access roads within 300 feet of the ESA sensitive waterbodies, and would implement the FWS' enhanced conservation measures for ESA sensitive waterbodies described in section 4.7.1. Additional sediment and erosion control measures that would be implemented on NFS lands are described in section 4.6.5.

Loss of Streambank Cover

Streamside vegetation, large woody debris, rocks, undercut banks, high flow channels, and floodplains are known cumulatively as riparian habitat. Riparian habitat provides valuable structure and opportunities for fish and stream biota. Open-cut crossings would temporarily remove this habitat and potentially cause locally elevated water temperatures and reduced levels of dissolved oxygen, making the locations less suitable for aquatic biota. Consequently, fish and other stream biota would likely be displaced to similar habitat upstream or downstream of the pipeline crossing.

As previously stated, clearing of trees and other riparian vegetation would be minimized to include only what is necessary to construct and operate the projects safely. Atlantic and DETI would minimize impacts on riparian vegetation by narrowing the width of its standard construction right-of-way at waterbody crossings to 75 feet. After construction is complete, streambeds and banks would be stabilized and restored to preconstruction conditions to the fullest extent possible. Streambed structure such as rock and gravel would be returned to the stream, and the stream banks would be revegetated with native tree and shrub species; only a 10-foot-wide corridor centered on the pipeline would be maintained with herbaceous vegetation. Restricting the herbaceous vegetation area to a small portion of the total right-of-way clearing would allow much of the ecological function of the riparian conditions (e.g., bank stabilization, filtration, shade, future large wood, and organic input) to more quickly return. Stream bank shrub and tree species would be expected to recover over several months to a few years. Streambed biota, such as invertebrates that serve as food sources for fishes, would be expected to recolonize the affected areas within days to months (Brooks and Boulton, 1991; Matthaei and Townsend, 2000) or longer for some species (Wallace, 1990). This would limit the overall long-term impacts of loss of riparian habitat to a small portion of each stream crossed, reducing future negative effects to aquatic biota.

Horizontal Directional Drill Crossings

Currently, 26 waterbodies (including two ditches) would be crossed using an HDD or conventional bore on ACP as described in sections 2.3.3.2 and 4.3.2 and appendix K; and two waterbodies on SHP would be crossed using a bore. The use of an HDD or bore allows the pipeline to be installed beneath the bed of a waterbody without affecting aquatic resources. Potential impacts associated with HDD crossings include erosion or sedimentation associated with the onshore operation of the HDD equipment and inadvertent releases of drilling fluids and associated impacts on water quality and aquatic organisms.

Drilling entry and exit points and workspaces are locations with an increased likelihood of inadvertent releases of drilling fluids and are typically located away from the waterbodies crossed to minimize potential impacts. Although drilling mud consists of non-toxic materials, it may leak through unidentified fractures below the surface, either along the path of the HDD or in adjacent areas. Most of inadvertent releases occur close to the HDD entry or exit points; however, drilling mud could also be released into a waterbody and settle on the stream bed, temporarily inundating the habitats used by these species. Benthic and less mobile resources as well as spawning and nursery habitat could be impacted from the settling of drilling mud. In addition, increased sedimentation and turbidity within waterbodies could impact predator/prey interactions and reproductive success. During the HDD process, Atlantic personnel and the contractor would conduct visual and pedestrian inspections along the drill path and continuously monitor drilling mud pressures and return flows. As detailed in Atlantic's *HDD Plan* (see appendix H), if drilling mud were released into a waterbody, Atlantic's contractor would take immediate action to control any inadvertent releases, clean up the affected area, and adjust minimize or prevent recurrence. As such, we conclude that the proposed HDD activities would not significantly affect aquatic resources or habitat.

The use of the HDD method would eliminate the need to conduct vegetation clearing at those locations. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. However, minor hand clearing of vegetation may occur at trenchless crossings to lay guidewires for construction or to place pumps for water withdrawal activities.

Dry Crossing Method (Pump and Dam/Flume/Cofferdam)

As discussed previously, Atlantic and DETI proposes to use a dry crossing method (i.e., flume, dam and pump, and cofferdam) to install approximately 940 waterbody crossings along ACP, and at all 55 waterbody crossings along SHP as identified in appendix K. Dry crossing methods involve the installation of a flume pipe(s) and/or dam and pump prior to trenching to divert the stream flow around the construction area and allow trenching of the stream crossing in drier conditions, isolated from the stream flow. These methods typically result in lower sedimentation and associated turbidity impacts when compared to conventional wet crossing methods.

The impacts of the dry crossing methods on fishery resources could include:

- increased sedimentation and water turbidity immediately downstream of the construction work area;
- direct contact with relatively immobile prey organisms (e.g., benthic and epibenthic) that may be food resources for fish;
- alteration or removal of aquatic habitat cover;
- introduction of pollutants through possibly contaminated bottom sediments or spills of fuels or lubricants;
- impingement or entrainment of fish and other biota associated with the use of water pumps at dam and pump crossings; and
- downstream scour associated with use of pumps or flume discharge.

In addition, removal of streamside vegetation at the crossings may reduce shading of the waterbody, diminish escape cover, and could, in small areas where flow is minimal or constrained, result in locally elevated water temperatures.

In accordance with the FERC *Procedures*, Atlantic and DETI would conduct in-water work outside of the sensitive fisheries TOYR identified in table 4.6.1-2, unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis.

The use of dry crossing construction techniques would reduce potential erosion and sedimentation within the stream channel by confining impacts to the construction work areas and minimizing impacts on downstream reaches. Atlantic and DETI would also implement the erosion and sedimentation control measures described in section IV.F of the FERC *Plan* and section V of the FERC *Procedures* (see table 2.3.1-1) to contain materials within the construction work areas and minimize impacts on aquatic resources due to changes in water quality.

Use of a dry crossing technique would have a direct impact on benthos and alteration of aquatic habitats. The impact would result from installation and removal of the temporary dams built to isolate the construction work areas, and from excavation of the pipeline trench. Installation of the temporary dams typically involves the placement of sand bags or equivalent dam diversion structures upstream and downstream of the construction work areas. The footprint of the dams is typically small but would temporarily bury existing benthic organisms within the footprint of the dams. Excavation of the pipeline trench would also directly impact existing benthos through removal and temporary stockpiling in upland areas of bottom sediment. These effects would be limited to a relatively small area. Following installation of the pipeline, the bed and banks would be restored and the temporary dams would be removed. The pipeline trench would be backfilled with the original sediment, restoring similar habitat conditions. Both the restored stream bed and the area beneath the dams would likely be colonized fairly quickly by benthic species from the adjacent areas of the waterbody.

The use of pumps to maintain stream flow around the construction work areas could entrain or impinge fish and other aquatic invertebrates. This potential impact would be minimized by screening the intakes of the pumping system, as described in section V.6.B of the FERC *Procedures* (see table 2.3.1-1). Appropriately sized screens or water intakes to avoid entrainment of sensitive species per agency recommendation would also be used, as described in section 4.7.1. However, some small fish and larvae as well as all forms of aquatic invertebrates would still be subject to entrainment, although the duration of this effect would be short term and would cease when the crossing is completed and normal streamflow is restored.

The dam and pump crossing method could also result in sediment scour downstream of the crossing if measures were not implemented to dissipate the energy of the pump discharge. As described in the FERC *Plan* and *Procedures* (see table 2.3.1-1), Atlantic and DETI would direct all discharges from the pumps through containment structures such as hay bales and/or filter bags located in well-vegetated upland areas to lower discharge velocity and reduce the potential for erosion. Water would not be discharged to the waterbody until after filtration or settling through an approved holding structure to avoid affecting water quality.

The use of the dam and pump crossing method could also temporarily restrict fish passage during the time it takes to install the pipeline. This short-term and localized interruption of fish passage is not anticipated to dramatically affect the migration of fish within the stream systems that would be crossed by the projects.

Impacts resulting from tree clearing adjacent to each crossing could increase the potential for sediment to enter the waterbody. Following the installation of the pipeline, streambanks would be restored, stabilized with erosion control measures, and revegetated.

Atlantic and DETI would implement procedures to further minimize potential impacts associated with loss of riparian shade and vegetation cover. Clearing of trees and other vegetation would be restricted to only what is necessary to safely construct and operate the pipelines. Once construction is complete, streambeds and banks would be quickly restored to preconstruction conditions to the fullest extent possible. Restoration, bank stabilization, and revegetation efforts, which are defined in FERC *Plan* and *Procedures* (see table 2.3.1-1), and Atlantic's *Restoration and Rehabilitation Plan* (appendix F), would minimize the potential for erosion from the surrounding landscape. Atlantic and DETI would also minimize erosion and sedimentation by implementing the WVDEP's *Erosion and Sediment Control Best Management Practice Manual* (WVDEP, 2006a), the Virginia *Erosion and Sediment Control Handbook* (VDEQ, 1992), the Pennsylvania *Erosion and Sediment Pollution Control Program Manual* (PDEP, 2012), and the North Carolina *Erosion and Sediment Control Planning and Design Manual* (North Carolina Sedimentation Control Commission et al., 2013).

To facilitate the re-establishment of a diverse forest within the disturbed construction right-of-way, restoration of forested riparian areas would include seeding and may include supplemental plantings of native tree and shrubs species as required and/or approved by the appropriate agencies. Any proposed enhancement of the forested riparian area restoration using plantings of native shrubs and trees would exclude a 10-foot-wide area centered on the pipeline that would be retained in an herbaceous state.

Atlantic has indicated that they would generally adhere to in-water TOYR where practicable, but may apply for waivers with the appropriate agencies if they are unable to adhere to the in-water TOYR described in appendix K.

As discussed in section 4.6.2, Atlantic and DETI would relocate freshwater mussel species in accordance with federal and state agency protocols and the *Freshwater Mussel Relocation Protocol for ACP in North Carolina*, and would also implement Atlantic's *Virginia Fish Relocation Plan* and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1) on reduce impacts to rare, threatened, and endangered aquatic species. In section 4.7.10 and appendix K, we recommend that Atlantic provide a hydrofracture potential analysis for Nottoway River (AP-1 MP 260.7) due to the potential presence of Roanoke logperch and potentially other ESA-listed, proposed, and/or under review species, and in section 4.7.1.8 and appendix K for the Neuse River (AP-2 MP 98.5) due to the potential presence of ESA-listed, proposed, or under review species; and state-listed species. If the hydrofracture potential is low, we recommend Atlantic use the HDD method at these crossings to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS to determine what additional conservation measures would be recommended at these crossings.

Implementation of Atlantic's and DETI's construction, restoration, and mitigation procedures (see table 2.3.1-1), species-specific conservation measures described in section 4.7, as well as our recommendations in this section, section 4.7, and appendices K, R, and S would result in limited, short-term impacts on aquatic resources and habitats. Invertebrate populations would recolonize the crossing area and all temporary construction workspace areas would revert to their original condition, including re-establishment of riparian cover. Furthermore, operation and routine maintenance of the pipeline rights-of-way would not have a significant impact on fishery resources in ACP or SHP project areas.

Open-cut Crossings (Wet-ditch Method)

Atlantic proposes to use the wet open-cut method at 91 waterbody crossings identified in appendix K; there are no wet open-cut crossings proposed on SHP. Wet, open-cut construction methods involve trenching within the waterbody under flowing conditions with backfill and restoration occurring quickly (typically within 24 to 48 hours) to limit impacts on the stream.

Clearing vegetation from the edges of waterbodies at the pipeline crossing location could reduce availability of habitat for fishery resources by reducing shade for the waterbody, diminishing escape cover, and locally elevating water temperatures. Further, higher water temperatures could potentially reduce levels of dissolved oxygen. In accordance with the FERC *Plan* and *Procedures* (see table 2.3.1-1), clearing of trees and other vegetation would be restricted to only what is necessary to safely construct and operate the pipeline to minimize potential effects associated with loss of riparian shade and vegetation cover. Following construction, Atlantic would restore streambeds and banks. Post-construction maintenance (or mowing) would be limited to that needed to facilitate periodic corrosion/leak surveys or to protect the integrity of the pipeline coating.

To facilitate the re-establishment of a diverse forest within the disturbed construction right-of-way, restoration of forested riparian areas would include seeding and may include supplemental plantings of native tree and shrub species as required and/or approved by the appropriate agencies. Any proposed enhancement of the forested riparian area restoration using plantings of native shrubs and trees would exclude a 10-foot-wide area centered on the pipeline that would be retained in an herbaceous state.

Of the 91 waterbodies that would be crossed using the open-cut method, approximately 25 currently have the potential or are known to contain sensitive species; however, surveys are pending at some waterbodies. Depending on the sensitive species potentially present, Atlantic would implement species-specific TOYR, or aquatic species relocation in accordance with federal and state agency mussel relocation protocols, the *Freshwater Mussel Relocation Protocol for ACP in North Carolina*, Atlantic's *Virginia Fish Relocation Plan* and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). We recommend in section 4.7 and appendix K a number of additional conservation measures by waterbody crossing, including the implementation of TOYR, aquatic species relocation, and the FWS' enhanced conservation measures described in section 4.7.1, where appropriate.

Carolina madtom has the potential to occur in 12 of the waterbodies currently planned for open-cut crossing; however, survey data are either pending or currently under review by the FWS. We recommend in section 4.7.1.11 that where FWS reviewed survey results indicate suitable habitat for Carolina madtom, Atlantic assume presence and implement the conservation measures described in section 4.7.1.11, as well as the FWS' enhanced conservation measures for ESA sensitive waterbodies defined in section 4.7.1.

We conclude that adherence to agency-recommended in-stream construction TOYR, the species-specific conservation measures outlined in section 4.7, and the implementation of the measures in the FERC *Plan* and *Procedures* and Atlantic's and DETI's construction and restoration plans (see table 2.3.1-1), as well as our recommendations in this section, section 4.7, and appendices K, R, and S, would reduce potential impacts on fisheries of special concern during construction of ACP and SHP.

Blasting

If blasting during waterbody crossings is deemed necessary, Atlantic and DETI would implement its *Blasting Plan* (see table 2.3.1-1) to minimize impacts on aquatic species. The effects of blasting on aquatic biota varies by species (Yelverton et al., 1975), but generally relatively small organisms and those close to the blast or near the sediment surface experience higher mortality (Yelverton et al., 1975; Munday et al., 1986). Non-lethal effects may include eye distension, hemorrhage, hematuria, and damage to bodily systems (Hastings and Popper, 2005; Godard et al., 2008; Carlson et al., 2011; Martinez et al., 2011). As described in appendix K, blasting may be required in most waterbodies crossed by ACP and SHP. Blasting is proposed in areas where rock may be encountered in the trenchline of ESA sensitive waterbodies. In these waterbodies, the need for blasting would be determined on a site-specific basis shortly ahead of construction at that waterbody. For all ESA sensitive waterbodies identified in appendix K determined to require blasting, a site-specific blasting plan would be prepared and submitted to the FWS and the appropriate state agency in accordance with the notification requirements prior to blasting. Atlantic has committed to conducting blasting in the dry and utilize matting to minimize noise and vibration. Atlantic would also adhere to the TOYR where applicable. Where TOYR cannot be met, waivers would be requested as warranted.

Water Appropriation and Discharge

To comply with DOT regulations, Atlantic would conduct hydrostatic testing of the pipeline prior to placing it into service. Table 4.3.2-9 lists the waterbodies that Atlantic and DETI would use as sources of HDD or hydrostatic test water. Based on FWS and our recommendations in the draft EIS, Atlantic and DETI are proposing to use municipal water sources for all water withdrawals previously planned at ESA sensitive waterbodies except for Jackson River, James River, Appomattox River, Tar River, and Contentnea Creek on ACP; and McElroy Creek on SHP. Atlantic is continuing to consult with alternative water supply options. Water used for dust control would also be appropriated from municipal sources. In addition, water withdrawal is proposed at Jennings Branch and South Fork Rockfish River which are brook trout streams, Back Creek and Calfpasture River where the Virginia SGCN and GWNF RFSS roughhead shiner has been documented, and at Blackwater River which provides migratory fish, spawning, and nursery habitat.

Atlantic would adhere to the applicable TOYR for water withdrawal in these waterbodies, as identified in appendix K. Atlantic and DETI would reduce impacts on aquatic resources by adhering to the measures in the FERC *Plan* and *Procedures* (see table 2.3.1-1), which include the use of mesh screens on intake pumps to reduce the impingement and entrainment of fishes, control of the flow rate to prevent erosion, streambed scour and sedimentation, and maintaining normal waterbody flow during hydrostatic test water withdrawals. To minimize potential impacts of water withdrawals on ESA-listed, proposed and under review species, we recommend in section 4.7.1 and appendix K that Atlantic and DETI implement the following measures at ESA sensitive waterbodies:

- use 1 mm or smaller screens to minimize impingement/entrainment of mussel host fish species and ESA-listed, proposed and under review species;
- limit water withdrawal to not exceed 10 percent of instantaneous flow;
- ensure that intake velocity does not exceed 0.25 f/s;
- use floating intake structures to avoid impacts on the stream bed; and
- implementation of TOYR.

All test waters would be withdrawn and discharged in compliance with the FERC *Plan* and *Procedures* (see table 2.3.1-1), and any state-specific requirements included in the applicable state discharge permits, including TOYR outlined in appendix K. Atlantic and DETI would also apply for the appropriate water appropriation and discharge permits prior to construction. The permits would detail discharge timing, volume, and locations. For water discharge:

- algaecide would not be added to hydrostatic test water; Atlantic would use aeration to control algae in storage containers;
- water would be discharged at a low flow rate to avoid erosion and rutting;
- Atlantic and DETI would restore the discharge site to pre-discharge conditions if vegetation or cover/mulch/duff is removed during discharge;

- filtration or chlorine removal methods would be used when municipal water is placed directly from the municipal source into the pipeline for use. When water is stored in aboveground containments for more than one week, the chlorine would dissipate during aeration and additional chlorine removal methods would not be needed;

- Atlantic and DETI would not discharge into ESA sensitive waterbodies; and

- Atlantic and DETI would discharge in upland areas a minimum of 300 feet from ESA sensitive waterbodies.

Aquatic Invasive Species

In letters dated February 7, 2017, and February 24, 2017, the VDGIF requested that the *Invasive Species Management Plan* be expanded to include invasive aquatic species recognized by regional (Mid-Atlantic Panel on Aquatic Invasive Species) or state (Virginia Invasive Species Workgroup, VDCR-DNH) authorities, such as zebra mussel (*Dreissena polymorpha*), and mitigation measures be implemented to address potential transference of these species during water withdrawal and discharge, and on construction equipment and personal vehicles.

Aquatic species are introduced and spread through many vectors including ship ballast, hull fouling, movement of equipment and gear between aquatic habitats, escapes from intentional introduction, discarded live bait, intentional release, product contaminations, construction of canals connecting waterbodies, or smuggling, trade or sale of organisms (Aquatic Invasive Species Management Committee, 2007). The Commonwealth of Pennsylvania Invasive Species Council Aquatic Invasive Species Management Plan (Aquatic Invasive Species Management Committee, 2007), West Virginia Invasive Species Strategic Plan and Voluntary Guidelines (West Virginia Invasive Species Working Group, 2014), and Virginia Invasive Species Management Plan (Virginia Invasive Species Council, 2005), available through the Mid-Atlantic Panel on Aquatic Invasive Species, describe aquatic plants and animals that have been documented in each state. There are numerous aquatic invasive plant and animal species identified in these documents, including but not limited to:

- Northern snakehead fish (*Channa argus*)
- Asian clam (*Corbicula fluminea*)
- Mute swan (*Cygnus olor*)
- Didymo (*Didymosphenia geminata*)
- Zebra mussel (*Dreissena polymorpha*)
- Chinese mitten crab (*Erlochelr sinensis*)
- Hydrilla (*Hydrilla verticillata*)
- Silver carp (*Hypophthalmichtys molitrix*)
- Purple loosestrife (*Lythrum salicaria*)
- Rusty crayfish (*Orconectes rusticus*)
- Virile crayfish (*Orconectes virilis*)
- Common reed (*Phragmites autralis*)
- Rapa whelk (*Rapana venosa*)

The Mid-Atlantic Panel on Aquatic Invasive Species developed a Field Guide to Aquatic Invasive Species (2015) that includes species found in Pennsylvania, West Virginia, Virginia, and North Carolina. The field guide includes 99 species selected by the Mid-Atlantic Panel on Aquatic Invasive Species that experts consider to be of most concern to the region, and provides recommendations to prevent the spread of these species. It also provides guidance on reporting and collecting specimens.

Atlantic and DETI would control the potential transport of invasive aquatic species through adherence to federal and state-specific regulations for preventing the land transport of such species, by primarily utilizing municipal sources for HDDs, hydrostatic testing, and dust control, and, where sourced from surface waters, by discharging hydrostatic test waters into well vegetated upland areas. It is also important to note that Atlantic and DETI conducted mussel surveys at all the waterbodies proposed for water withdrawal during 2015 and 2016 surveys and did not document zebra mussels at any of these locations.

Atlantic and DETI would conduct mussel relocation survey and efforts in waterbodies in West Virginia, Virginia, and North Carolina, and would conduct general aquatic species relocations in Virginia and North Carolina. Relocation efforts are currently proposed at a total of 566 waterbodies on ACP and three waterbodies on SHP. During these efforts, qualified biologists would identify collected specimens to the species level, if possible, and relocate individuals per the protocol. To account for the potential capture of invasive species and prevent their relocation, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, revised *Virginia Fish Relocation Plan, Freshwater Mussel Relocation Protocol for ACP in North Carolina,* and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Activities.* These revised plans and protocols should include notification to the appropriate federal and/or state agencies should an invasive aquatic species be observed or collected during relocation efforts; and, in consultation with the appropriate federal and/or state agency, identify the mitigation measures that Atlantic and DETI will implement at the crossing location if invasive aquatic species are observed.**

Atlantic and DETI would also implement mussel relocation efforts where mussels were identified during field surveys according to the *West Virginia Mussel Survey Protocol* (Clayton et al., 2016). To account for the potential capture of invasive species and prevent their relocation during these relocation efforts, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, an aquatic invasive species protocol for West Virginia mussel relocation efforts on both ACP and SHP.**

Atlantic and DETI would conduct in-water activities at other waterbodies where relocation efforts are not proposed that would involve the placement of equipment and gear into waterbodies for periods of time, and could serve as means to inadvertently transport aquatic invasive species. To account for the potential transportation of aquatic invasive species between waterbodies, we recommend that Atlantic and DETI consider voluntarily implementing the recommendations in the Mid-Atlantic Panel on Aquatic Invasive Species Field Guide for the prevention of the introduction and spread of aquatic species between each waterbody, including:

- inspecting and removing aquatic plants, animals, seeds, and mud from equipment and gear, paying attention to cracks and crevices**;**
- draining lake or river water from equipment before leaving water access; and

- washing equipment and personal gear (waders, boots) with high pressure, hot tap water, or drying equipment and gear in the sun for at least 10 days or freeze for at least 2 days before reuse.

Spill Prevention, Control, and Countermeasures

Accidental spills of construction-related fluids (e.g., oil, gasoline, or hydraulic fluids) into waterbodies could result in water quality impacts that affect fish and other aquatic organisms in adjacent streams, if present. The potential impact would depend on the type and quantity of the spill, and the dispersal and attenuation characteristics of the waterbody. An inadvertent release of fuel or equipment fluids could have acute impacts on fish and aquatic species including direct mortality, altered behavior, changes in physiological processes, or changes in food sources. In turn, ingestion of large numbers of contaminated fish or aquatic species could impact other species located higher in the food chain that prey on these biota. Minimization and mitigation procedures related to water quality are discussed in section 4.3. To reduce the potential for surface water contamination and resulting impacts on aquatic life, Atlantic and DETI would implement its *SPCC Plan* (see table 2.3.1-1), which includes BMPs to minimize the potential for accidental releases and measures that would be implemented to clean up any releases. Additional measures in the FERC *Plan* and *Procedures* (see table 2.3.1-1) include conducting routine inspections of construction equipment, tanks, and storage areas to help reduce the potential for spills or leaks; restricting refueling and the handling of hazardous materials to greater than 100 feet from wetland and waterbody resources; and the use of secondary containment around all containers and tanks. With adherence to these measures, we conclude that impacts on aquatic resources from potential spills would be adequately minimized.

4.6.5 Aquatic Resources on Federal Lands

The general impacts and mitigation measures described above in section 4.6.4 would also apply to NFS lands. The FS expressed concern regarding the potential for increased sedimentation caused by erosion of exposed soil in the pipeline construction workspace, access roads, and staging areas to affect the HUC12 subwatersheds that ACP would cross within the MNF and GWNF. Atlantic has prepared a Soil Erosion and Sedimentation Model Report assessing the extent of sedimentation that could occur within these priority subwatersheds during construction. Table 4.6.5-1 presents the results of Atlantic's Soil Erosion and Sedimentation Model Report by subwatersheds occurring in the MNF and GWNF. The model results indicate an annual soil loss ranging from 2.19 to 8.00 tons/acre during the first year of construction, which equates to approximately 200 to 800 percent above baseline erosion rates for the subwatershed (0.4 to 1.33 mm of soil loss). Soil erosion rates are predicted to be higher where there are steeper slopes and higher soil erodibility values. The model results indicate a decline in soil erosion with time as the construction workspace is restored and becomes revegetated. In most cases, predicted soil erosion rates returned to baseline by the third year. The model results also accounted for the implementation of soil erosion devices, such as water diversion bars and standard silt fencing, and assumed these erosion control devices would reduce erosion by 96 percent. Although these results indicate a substantial increase in soil erosion relative to baseline rates as averaged across a year, in reality, erosion and sedimentation will be event-driven, occurring in response to precipitation events, and will likely be episodic. As stated in the Erosion and Sediment Model Report, one ton/year of soil entering a waterbody with a flow of 1 cubic feet per second would result in 1 milligram per liter (mg/l) of suspended solids. The 1986 EPA Quality Criteria for Water indicates that settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonably established norm for aquatic life (EPA, 2003). Although baseline concentrations for suspended solids and turbidity concentrations are not currently available for most of the waterbodies proposed to be crossed by ACP, and this criterion is more relevant to lakes and large rivers, and not readily applicable to shallow flowing mountain streams, turbidity would be used to monitor water quality impacts as described below.

TABLE 4.6.5-1

Sediment and Erosion Control Analysis Results Summary by Subwatershed Segment in the Monongahela National Forest and George Washington National Forest

Subwatershed	Segment Area (acres)	Baseline Erosion (ton/ac-yr) [a]	Construction Erosion (ton/ac-yr) Year 1	Year 2	Year 3	Year 4	Year 5	Total
MONONGAHELA NATIONAL FOREST								
Dry Fork-Elk River	73.9	<1	6.45	1.81	<1	<1	<1	9.42
Old Field Fork	86.5	<1	7.80	2.32	<1	<1	<1	11.50
Clover Creek-Greenbrier River	162.6	<1	8.00	2.38	<1	<1	<1	11.80
Sitlington Creek	47.2	<1	7.45	3.15	1.07	<1	<1	12.30
Headwaters Knapp Creek	62.8	<1	5.85	1.57	<1	<1	<1	8.54
GEORGE WASHINGTON NATIONAL FOREST								
Jim Dave Run-Back Creek	113.7	<1	4.30	2.32	<1	<1	<1	8.14
Bolar Run-Jackson River	98.7	<1	4.26	2.05	<1	<1	<1	7.70
Dry Run	50.9	<1	2.98	1.14	<1	<1	<1	5.03
Scotchdown Draft-Cowpasture River	33.0	<1	3.74	1.73	<1	<1	<1	6.68
Lick Run-Stuart Run	87.6	<1	4.12	1.43	<1	<1	<1	6.66
Cabin Creek-Mill Creek	21.4	<1	2.56	<1	<1	<1	<1	4.29
Hamilton Branch	12.6	<1	2.19	1.13	<1	<1	<1	4.23
Chair Draft-Calfpasture River	32.7	<1	3.95	1.62	<1	<1	<1	6.74
Jennings Branch	56.0	<1	3.96	1.60	<1	<1	<1	6.75
Moffett Creek	21.1	<1	3.12	<1	<1	<1	<1	4.82
Inch Branch-Back Creek	18.8	<1	3.13	1.22	<1	<1	<1	5.30

[a] The RULES2 model is not sensitive to values less than 1 ton/acre; therefore, <1 more accurately represents these results.

Section 19.0 of Atlantic's *COM Plan* describes the Water Quality Monitoring Plan that would be implemented on NFS lands to monitor and address chronic impacts to water quality according to state numeric water quality standards for turbidity. Atlantic would conduct turbidity measurements at all stream crossings that are state-designated as either CWF or significant coolwater or warmwater fisheries in West Virginia. Waters are not classified as cold or warmwater fisheries in Virginia. The FS would continue to consult with Atlantic to complete the *COM Plan* for construction of ACP on NFS lands, including consultation with the GWNF to determine which categories of the Commonwealth Regulatory Classification should be monitored (e.g., Aquatic Life, Class I-IV trout waters) during construction. Also note that we recommend in section 4.6.1 that Atlantic provide an updated Master Waterbody Crossing table (appendix K).

Monitoring would take place at a minimum rate of four times per day during the period when active construction is occurring, in both the background location and downstream location. Monitoring would take place 30 minutes prior to construction, a minimum of 2-4 hours after start of in-stream construction, and during in-stream pipeline construction. Once the crossing is complete and restoration occurs, monitoring would be conducted for four days at a minimum rate of 1 time per day. Should the chronic turbidity reading (4-day average) exceed standards, remediation of the source would be implemented, and monitoring would continue once per day until the source is addressed and readings are within water quality standards. Additional monitoring of stream habitat and biota has been requested by the GWNF; see section below for discussion.

In addition, Atlantic would implement the following BMPs for all stream crossings to reduce impacts:

- develop and implement state-approved *Erosion and Sediment Control Plan*;
- develop site-specific BMPs to address steep slopes and unique crossing conditions;
- install sediment barriers;
- appropriately site sediment filtering devices associated with trench dewatering activities;
- reduce the volume of large equipment operating in or near the waterbody; and/or
- halt work, if necessary to address issues or implement corrective actions.

In section 4.6.1, we noted that during our review of the ACP Master Waterbody Crossing Table (5/8/17 version), we found several discrepancies in number of crossings, crossing techniques, and locations when compared to other supplemental information provided by Atlantic. In addition, based on our recent correspondence with the FWS and state agencies, we noted that the TOYR for some waterbodies were incorrect, or conservation measures were incorrect or incomplete. In appendix K, we have provided a "FERC Recommended Conditions" column that identifies the revisions or clarifications needed for each waterbody. Furthermore, we recommend in section 4.7.1 that, as part of their Implementation Plan, Atlantic and DETI should file with the Secretary and the appropriate federal and state agencies revised Master Waterbody Crossing tables for ACP and SHP that have addressed the recommended conditions in the identified column of appendix K. The revised table or accompanying filing should document correspondence and input from the appropriate federal and state agencies regarding the updated information and any additional mitigation measures to be incorporated for each waterbody.

Monongahela National Forest

There are 21 waterbody crossings on the MNF (some waterbodies are crossed more than once), including 4 perennial streams, 13 intermittent streams, and 4 ephemeral streams. Two of these waterbodies would be crossed by AP-1 using a dry crossing method and include an unnamed tributary to Shock Run and unnamed tributary to Sugar Camp Run. Permanent access roads are proposed across the remaining 19 waterbodies including Slaty Fork, 17 crossings of unnamed tributaries to Slaty Fork, and 1 crossing of an unnamed tributary to Sugar Camp Creek (refer to appendix K[12]). Blasting would be required in-stream at the two pipeline crossing locations (MPs 81.5 and 82.0). No water withdrawal is proposed of any of these 21 waterbodies. The September 15 to March 31 TOYR for in-water activities would apply to all the HQS and trout streams, and additional erosion control measures would be applied at the four perennial trout streams from October 1 to June 1 TOYR on the MNF. Atlantic was not required to conduct surveys for MNF aquatic RFSS species where these species were previously documented within the associated subwatershed and species presence would be assumed. Consequently, Atlantic did not conduct surveys for candy darter, New River shiner (*Notropis scabriceps*), Appalachia darter (*Percina gymnocephala*), Kanawha minnow (*Phenacobius teretulus*), elktoe (*Alasmidonta marginata*), and green floater (*Lasmigona subviridis*). Although suitable habitat for these species is unlikely to be present at the ACP waterbody crossing locations on the MNF, there is potential for suitable habitat for one or more of these species to be present downstream of the crossing location. Additional discussions on potential impacts on these species resulting from construction and operation activities on the MNF are presented in section 4.7.3 and appendix R.

[12] Waterbodies in appendix K that are located on NFS are shaded.

George Washington National Forest

There are 36 waterbody crossings on the GWNF (some waterbodies are crossed more than once), including 13 perennial streams, 15 intermittent streams, 6 ephemeral streams, and 2 ponds. Twenty-six of these waterbodies would be crossed by AP-1 using a dry crossing method. There are 6 permanent access roads proposed across waterbodies, and 2 waterbodies would be crossed using existing trails to new temporary access roads. Twelve of these waterbodies are wild brook trout waters, or unnamed tributaries to wild brook trout waters with an associated TOYR for in-water activities between October 1 and March 31. Atlantic has committed to adhering to this TOYR.

Based on comments submitted on September 1, 2016, from the GWNF, as well as our recommendations in the draft EIS, Atlantic has eliminated the access road crossing of Laurel Run, and the unnamed tributaries to Laurel Run, which are wild brook trout streams located in Bath and Augusta Counties, Virginia. However, in the recent version of the Master Waterbody Crossing Table (appendix K) submitted by Atlantic on May 8, 2017, Atlantic indicates that it would impact two ponds near Brown's Pond SBA. It appears that these crossings may be associated with access road 36-016.AR1. As discussed in section 4.4.7, the Brown's Pond SBA is considered a site of Outstanding Significance due to presence of Central Appalachian Mountain Ponds, a rare community type that supports sensitive plant species and serves as important breeding habitat for amphibians and insects. In addition, the information provided by Atlantic to date regarding planned improvements for proposed access road 36-016.AR1 have been inconsistent, and we recommend in section 4.4.7 that Atlantic provide detailed mapping of the existing conditions and proposed improvements to access road 36-016.AR1, including digital data, a description of the construction and operation impacts, including impacts on the adjacent vegetation communities, potential pond crossings identified in appendix K, and GWNF locally rare species located downslope; and identify the conservation measures Atlantic would implement to mitigate potential impacts. Due to the sensitivity of this community, additional consultation with the FS on these potential pond crossings will be required.

The GWNF requested that Atlantic complete surveys for the following RFSS species: roughhead shiner (*Notropis semperasper*), orangefin madtom, and the yellow lance mussel (*Elliptio lanceolata*) (see section 4.7.3 and table R-2 in appendix R), and the locally rare Potomac sculpin (*Cottus girardi*) (see section 4.7.3.3 and table R-4 in appendix R). These surveys did not observe any of these species at the crossing locations, nor was suitable habitat for these species observed at the crossing location. Additional discussions on potential impacts on these species resulting from construction and operation activities on the GWNF are presented in section 4.7.3 and appendix R.

While the discussion on sediment effects to aquatic resources in section 4.6.4 above references the Newcombe and Jensen model (1996) to quantify impacts on fishes exposed to suspended sediment in waterbodies, and that results suggest mostly sublethal effects with limited habitat degradation, it should be recognized that Newcombe and Jensen (1996) stated that '[o]ur analysis has shown, in particular, that sublethal effects thresholds are poorly delineated for most groups." Since thresholds for the species that will be encountered on the GWNF have not been determined, use of the Idaho model can elucidate general effects, but the direct comparison should not be overstated.

Because of concerns about stream impacts, additional monitoring of stream habitat and biota was requested by the GWNF. This consisted of baseline benthic macroinvertebrate and habitat surveys prior to pipeline construction and a subsequent survey after pipeline construction to determine if the benthic community has been impacted due to habitat modifications (e.g., sedimentation) or water quality influences. Atlantic developed the GWNF Baseline Benthic Macroinvertebrate Survey Study Plan in May 2016, and sampled stream crossings on the GWNF in 2016 and 2017.

4.6.6 Conclusion

Based on our review of potential impacts on aquatic resources as described above, we conclude that ACP and SHP would result in temporary to long-term impacts on aquatic resources. Long-term impacts related to slope instability adjacent to waterbodies at locations identified in section 4.1.4.2 have the potential to adversely impact water quality and stream channel geometry, and therefore downstream aquatic biota. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted (see section 4.1.4.2 for additional discussion).

Atlantic and DETI would reduce impacts on aquatic resources through implementation of the measures in the FERC *Plan* and *Procedures* (see table 2.3.1-1), Atlantic's *COM Plan* (see appendix G) on NFS lands, *HDD Plan* (see appendix H), *Rehabilitation and Restoration* (see appendix F), and *West Virginia Mussel Survey Protocol* (Clayton et al., 2016), *Freshwater Mussel Guidelines for Virgini*a (FWS and VDGIF, 2015a), *Freshwater Mussel Relocation Protocol for ACP in North Carolina, Virginia Fish Relocation Plan*, and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1), adherence to TOYR for all in-stream construction activities, additional species-specific conservation measures identified above and in section 4.7, and compliance with our recommendations provided throughout this EIS.

4.7 SPECIAL STATUS SPECIES

Special status species are afforded protection by law, regulation, or policy by state and federal agencies. Special status species generally include federally listed species that are protected under the ESA, species proposed or petitioned for listing under the ESA, are considered as candidates for such listing by the FWS or NMFS, are species protected by other federal land-managing agencies, such as the FS, or are species that are state-listed as threatened, endangered, or have been given other state designations.

To assist in compliance with section 7 of the ESA, Atlantic and DETI, acting as the FERC's non-federal representatives, initiated informal consultation with the FWS and NMFS regarding federally listed species and designated critical habitat. Atlantic and DETI also consulted with the FS and state agencies to identify species that are known to occur in the general vicinity of ACP and SHP. The details of these consultations are described in the sections below.

Atlantic and DETI surveyed the ACP and SHP project areas to determine whether special status species or their habitat would be affected. The survey corridor was generally 300 feet wide, but was expanded in certain areas to accommodate potential variability in the proposed pipeline alignment. Based on special status species habitat preferences and the results of the habitat surveys, Atlantic and DETI, as well as the FWS, NMFS, FS, and state agencies determined which special status species have the greatest potential to be affected by ACP and SHP. The narrowed list of special status species was then used to develop survey requirements and protocols. The survey plans identified which special status species required species-specific surveys, where the surveys should be conducted, and what time of year the surveys should be completed. Where surveys identified ESA-listed, proposed, or under review species, location information has not been disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information.

Atlantic and DETI completed habitat and species surveys in 2015 and 2016 and filed survey reports that outlined the survey methodologies, locations where surveys were conducted, and the survey results. If a special status species was identified, the location was recorded and information about the species characteristics and habitat was documented. Species-specific surveys remain to be completed on various properties where survey access has been denied and where preconstruction surveys would be completed. Survey results would be provided when available. Because surveys and our consultations are ongoing, **we recommend that:**

- **Atlantic and DETI <u>should not begin construction of the proposed facilities until</u>:**
  - **a. all outstanding biological surveys are completed;**
  - **b. the FERC staff complete any necessary section 7 consultation with the FWS; and**
  - **c. Atlantic and DETI have received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin.**

4.7.1 Endangered Species Act-Protected Species

Federal agencies, in consultation with the FWS and/or NMFS, are required by ESA section 7(a)(2) to ensure that any action authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species or species proposed for listing, or result in the destruction or adverse modification of designated critical habitat. As the lead federal agency, the FERC is responsible for consulting with the FWS and/or NMFS to determine whether any ESA-listed endangered or threatened species or any of their designated critical habitats are near the proposed action, and to determine the proposed action's potential effects on those species or critical habitats.

For actions involving major construction activities with the potential to affect listed species or critical habitats, the lead federal agency must prepare a Biological Assessment (BA) for those species that may be affected. The lead federal agency must submit its BA to the FWS and/or NMFS and, if it is determined that the action may adversely affect a ESA-listed species, the lead agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS and/or NMFS would issue a Biological Opinion as to whether the federal action would likely adversely affect or jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. For ACP and SHP, we have determined that ESA-listed species may be adversely affected, and are submitting a BA to the FWS and NMFS, provided as section 4.7 of this EIS.

Although under review species do not receive federal protection through the ESA, we considered the potential effects on these species and habitats so that section 7 consultation could be facilitated in the event one or more of these species become listed before or during ACP or SHP construction. Should a federally listed, proposed, petitioned, or candidate species be identified during construction that has not been previously identified during field surveys or assessed through consultation, and project activities could adversely affect the species, the Applicants are required to suspend the construction activity and notify the Commission and FWS of the potential affect. The construction activity could not resume until the Commission completes its section 7 consultation with the FWS.

Atlantic and DETI, acting as the FERC's non-federal representatives for the purpose of complying with section 7(a)(2) of the ESA, initiated informal consultation with the Pennsylvania, West Virginia, Virginia, and North Carolina Field Offices of the FWS, and the Northeast and Southeast Regions of NMFS regarding ESA-listed threatened, endangered, or proposed species potentially occurring in or near ACP and SHP project areas. We have reviewed the data provided by Atlantic and DETI, and provide the following sections summarizing species accounts, potential impacts, conservation measures that would be implemented and determinations, and additional research and consultation with the FWS and NMFS. We have also made recommendations to Atlantic and DETI for some species.

The FWS and NMFS identified 32 ESA-listed threatened or endangered species, 1 proposed species, 1 proposed critical habitat, and 6 species that are currently under review for federal listing that are known to occur in ACP and SHP project areas. Most of these species are under the jurisdiction of the FWS; however, two species, the shortnose sturgeon and Atlantic sturgeon, are under the jurisdiction of NMFS. The proposed critical habitat for Atlantic sturgeon is also under the jurisdiction of NMFS. For under review species, if the species is warranted for listing based on the status review, the FWS will typically proceed with a concurrent proposed listing rule and proposed critical habitat designation, if critical habitat is prudent and determinable. The FWS will finalize or withdraw the listing about 12 months after the proposed rule depending on comments received; ESA protections become effective 30 days after the final listing rule is published.

Table 4.7.1-1 lists all potentially affected ESA-listed, proposed, and under review species, and designated and proposed critical habitat, indicates the state(s) where they may occur, and provides our determination of effect. While Atlantic and DETI conducted surveys for several ESA-listed species or species under review, survey access was not available in all cases (see table 4.7.1-1). In addition, as noted throughout this section and in our recommendations, Atlantic and DETI continue to consult with the FWS to finalize conservation measures for some species. The FWS would re-evaluate our determinations for these species upon receipt of pending survey results and finalized conservation measures. It is also important to note that the FS issues its final NEPA decisions upon completion of a Biological Opinion from the FWS and NMFS.

Four species were not carried forward for further analysis based on review of available data and consultation with the FWS for the reasons described in the table. These species are identified in table 4.7.1-1 with an asterisk (*) and are not discussed further in this section. ESA-listed, proposed, or under review species that have the potential to occur within the MNF and/or GWNF are indicated in table 4.7.1-1 with a footnote, and each species has a subsection describing the potential occurrence, impacts, and FS-specific conservation measures that would apply to these species, as applicable. Species protected by the Marine Mammal Protection Act (MMPA) are further discussed in section 4.7.2. Migratory birds and bald and golden eagles are discussed in section 4.5.3.

General Conservation Measures

Atlantic's and DETI's construction and restoration plans (see table 2.3.1-1) include several measures that would mitigate the potential impacts on vegetation, wildlife, and aquatic species, including ESA-listed, proposed, and under review species and their habitat. Sections 4.4, 4.5, and 4.6 provide a discussion of general impacts and mitigation measures on vegetation, wildlife, and aquatic resources, respectively, that would also be applicable to the ESA-listed, proposed, and under review species described in the following sections. Additional conservation measures recommended by the FWS to mitigate potential impacts on these species are discussed below.

TABLE 4.7.1-1

ESA-listed, Proposed, and Under Review Species with the Potential to Occur in the Atlantic Coast Pipeline and Supply Header Project Areas

Project/Species (Scientific Name)	Federal Status	County, State Occurrence	ESA Determination [c]	Survey Status
ATLANTIC COAST PIPELINE				
Mammals				
Virginia big-eared bat [a, b] (*Corynorhinus townsendii virginianus*)	E	Randolph, WV Highland, Bath, VA	NLAA	Pending surveys at 46 acoustic sites and 60.7 acres of hibernacula surveys; 11 potential hibernacula locations require Phase 1 surveys, and 6 potential hibernacula locations require Phase 2 surveys in 2017.
Gray bat [b] (*Myotis grisescens*)	E	Bath, VA	NLAA	Pending surveys at 25 acoustic sites in 2017[e].
Indiana bat [a, b] (*Myotis sodalis*)	E	Harrison, Lewis, Upshur, Randolph, Pocahontas, WV Highland, Bath, Augusta, Rockbridge [d], VA	LAA NE on CH	Pending surveys at 80 acoustic sites, 9 mist net sites, 210.1 acres of hibernacula surveys, and 92.4 acres of roost tree surveys; 49 potential hibernacula locations require Phase 1 surveys, and 23 potential hibernacula locations require Phase 2 surveys in 2017.
Northern long-eared bat [a, b] (*Myotis septentrionalis*)	T	Harrison, Lewis, Upshur, Randolph, Pocahontas, WV Highland, Bath, Augusta, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, Greensville, Southampton, City of Suffolk, City of Chesapeake, Rockbridge [d], Fluvanna [d], Prince George [d], Isle of Wight [d], VA	LAA	Pending surveys at 113 acoustic sites, 11 mist net sites, 210.1 acres of hibernacula surveys, and 92.4 acres of roost tree surveys; 49 potential hibernacula locations require Phase 1 surveys, and 23 potential hibernacula locations require Phase 2 surveys in 2017.
Birds				
Red-Cockaded Woodpecker (*Leuconotopicus borealis*)	E	Southampton, City of Suffolk, VA Northampton, Halifax, Nash, Wilson, Johnston, Sampson, Cumberland, Robeson, Harnett [d], Scotland [d], NC	NLAA	Surveys complete.
Wood Stork * (*Mycteria americana*)	E	Not listed in counties crossed by ACP	NE	Desktop habitat and Natural Heritage data analysis complete; surveys not required.
Reptiles				
American alligator * (*Alligator mississippiensis)*	T	Sampson, Cumberland, Robeson, Scotland [d], NC	NE	Listed due to similarity in appearance to crocodile; no surveys required.
Amphibians				
Cheat mountain salamander [a] (*Plethodon nettingi)*	T	Randolph, Pocahontas, WV	NE	Surveys complete.

TABLE 4.7.1-1 (cont'd)

ESA-listed, Proposed, and Under Review Species with the Potential to Occur in the Atlantic Coast Pipeline and Supply Header Project Areas

Project/Species (Scientific Name)	Federal Status	County, State Occurrence	ESA Determination [c]	Survey Status
Neuse River waterdog (*Necturus lewisi*)	Under Review	NC	NA	Surveys pending at 3 waterbodies in 2017.
Fish				
Shortnose sturgeon (*Acipenser brevirostrum*)	E	Not Applicable	NLAA	Surveys not conducted; presence assumed.
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*): New York Bight DPS	E	Northampton and Halifax, NC	NLAA	Surveys not conducted; presence assumed.
Atlantic sturgeon: Chesapeake Bay DPS	E	Northampton and Halifax, NC	NLAA	Surveys not conducted; presence assumed.
Atlantic sturgeon: Carolina DPS	E PCH	Johnston, Northampton, and Halifax, NC	NLAA NAM	Surveys not conducted; presence assumed.
Atlantic sturgeon: South Atlantic DPS	E	Northampton and Halifax, NC	NLAA	Surveys not conducted; presence assumed.
Atlantic sturgeon: Gulf of Maine DPS	T	Northampton and Halifax, NC	NLAA	Surveys not conducted; presence assumed.
Cape Fear shiner * (*Notropis mekistochlas*)	E	Harnett [d], NC	NE	Species not documented within ACP project area; no surveys required.
Roanoke logperch (*Percina rex*)	E	Prince Edward, Nottoway, Dinwiddie, Brunswick, Greensville, Southampton, Prince George [d], VA	LAA	Surveys pending at 1 waterbody in 2017.
Carolina madtom (*Noturus furiosus*)	Under Review	Johnston, Nash, Wilson, NC	NA	Pending surveys at 5 waterbodies in 2017.
Candy darter (*Etheostoma osburni*)	Under Review	Pocahontas, WV	NA	Surveys not conducted; presence assumed.
Invertebrates				
Madison Cave isopod [b] (*Antrolana lira*)	T	Augusta, Rockbridge [d], VA	LAA	No individual survey protocol available for this species.
Saint Francis' satyr butterfly * (*Neonympha mitchellii francisci*)	E	Cumberland, NC	NE	Species not documented within ACP project area; no surveys required.
Chowanoke crayfish (*Orconectes carolinensis*)	Under Review	VA, NC	NA	Pending additional surveys at 1 site in 2017.
Dwarf wedgemussel (*Alasmidonta heterodon*)	E	Nottoway, VA Halifax, Nash, Wilson, Johnston, NC	NLAA	Pending additional surveys in 2017.
Clubshell mussel [a] (*Pleurobema clava*)	E	Harrison, Lewis, Upshur, WV	LAA	Surveys complete.
James spinymussel [b] (*Pleurobema collina*)	E	Highland, Bath, Augusta, Nelson, Buckingham, Rockbridge [d], Fluvanna [d], VA	NLAA	Pending additional surveys in 2017.
Tar River spinymussel (*Elliptio steinstansana*)	E	Halifax, Nash, Johnston, NC	NLAA	Pending additional surveys in 2017.
Snuffbox mussel (*Epioblasma triquetra*)	E	Harrison, Lewis, Upshur, WV	NLAA	Surveys complete.
Yellow lance mussel [b] (*Elliptio lanceolata*)	PT	VA, NC	NJ	Pending additional surveys in 2017.

TABLE 4.7.1-1 (cont'd)

ESA-listed, Proposed, and Under Review Species with the Potential to Occur in the Atlantic Coast Pipeline and Supply Header Project Areas

Project/Species (Scientific Name)	Federal Status	County, State Occurrence	ESA Determination [c]	Survey Status
Atlantic pigtoe mussel [b] (*Fusconaia masoni*)	Under Review	Bath, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, Greensville, Southampton, Rockbridge [d], Fluvanna [d], VA NC	NA	Pending additional surveys in 2017.
Green floater [a, b] (*Lasmigona subviridis*)	Under Review	Bath, Nelson, Buckingham, Cumberland, Nottoway, Dinwiddie, Rockbridge [d], Fluvanna [d], VA NC	NA	Pending additional surveys in 2017.
Rusty patched bumble bee (*Bombus affinis*)	E	Not listed in counties crossed by ACP	NLAA	Surveys not required.
Plants				
Shale barren rock cress [b] (*Arabis serotina*)	E	Pocahontas, WV Highland, Bath, Augusta, Rockbridge [d], VA	NE	Pending additional surveys in 2017.
Virginia sneezeweed [b] (*Helenium virginicum*)	T	Augusta, Rockbridge [d], VA	NE	Pending additional surveys in 2017.
Swamp pink [b] (*Helonias bullata*)	T	Augusta, Nelson, Rockbridge [d], VA	NE	Pending additional surveys in 2017.
Small whorled pogonia [a, b] (*Isotria medeoloides*)	T	Pocahontas, Randolph, WV, Highland, Nelson, Buckingham, VA	LAA	Pending additional surveys in 2017.
Pondberry (*Lindera melissifolia*)	E	Sampson, Cumberland, NC	NE	Pending additional surveys in 2017.
Rough-leaved loosestrife (*Lysimachia asperulaefolia*)	E	Cumberland, Harnett [d], Scotland [d], NC	NE	Pending additional surveys in 2017.
Eastern prairie fringed orchid (*Platanthera leucophaea*)	T	Augusta, VA	NE	Surveys complete.
Michaux's sumac (*Rhus michauxii*)	E	Nottoway, Dinwiddie, Brunswick, VA Nash, Wilson, Johnston, Cumberland, Robeson, Scotland [d], NC	NE	Pending additional surveys in 2017.
Northeastern bulrush [b] (*Scirpus ancistrochaetus*)	E	Pocahontas, WV, Highland, Bath, Augusta, Rockbridge [d], VA	NE	Pending additional surveys in 2017.
American chaffseed (*Schwalbea americana*)	E	Cumberland, Scotland [d], NC	NE	Pending additional surveys in 2017.
Running buffalo clover [a] (*Trifolium stoloniferum*)	E	Randolph, Pocahontas, WV	LAA	Pending additional surveys in 2017.
Virginia spiraea [a, b] (*Spiraea virginiana*)	T	Randolph, Pocahontas, WV	NE	Pending additional surveys in 2017.
SUPPLY HEADER PROJECT				
Mammals				
Indiana bat	E	Westmoreland, Greene, PA Harrison, Lewis, Doddridge, Tyler, Wetzel, Marshall, WV	LAA	Surveys complete.
Northern long-eared bat	T	Westmoreland, Greene, PA Harrison, Lewis, Doddridge, Tyler, Wetzel, Marshall, WV	LAA	Surveys complete.
Invertebrates				
Clubshell mussel [a]	E	Harrison, Lewis, Doddridge, Tyler, Wetzel, WV	NLAA	Surveys complete.

TABLE 4.7.1-1 (cont'd)				
ESA-listed, Proposed, and Under Review Species with the Potential to Occur in the Atlantic Coast Pipeline and Supply Header Project Areas				
Project/Species (Scientific Name)	Federal Status	County, State Occurrence	ESA Determination [c]	Survey Status
Snuffbox mussel	E	Westmoreland, PA Doddridge, Tyler, Wetzel, Marshall, Harrison, WV	NLAA	Surveys complete.

E = Endangered, T = Threatened, CH = Critical Habitat, DPS = distinct population segments, P = Proposed, PCH = Proposed Critical Habitat, NE = No Effect, NLAA = Not Likely to Adversely Affect, NAM = No Adverse Modification, NA = Not Applicable (not yet listed or proposed under the ESA), NJ = Not Likely to Jeopardize

[a] Occurs or has the potential to occur within the MNF.

[b] Occurs or has the potential to occur within the GWNF.

[c] FERC and FWS will re-evaluate the ESA determinations upon receipt of pending survey results and proposed conservation measures.

[d] Proposed communication towers for ACP (see table 2.1.2-6).

[e] Acoustic surveys did not target target this species specifically, and there is no approved survey method for this species.

* Species not likely to be found in ACP or SHP project areas and not carried forward for further analysis.

Note: County and State occurrence information is based on the FWS Environmental Conservation Online System Information for Planning and Conservation (IPaC) (https://ecos.fws.gov/ipac/) accessed May 2017. The FWS have provided additional information about potential species occurrences, which are discussed in each species subsection.

Aquatic Species

Waterbodies that are known or have the potential to contain ESA-listed, proposed, or under review species are identified in **bold** in appendix K. ESA sensitive waterbodies include those identified in appendix K, as well as perennial tributaries to these designated waterbodies located within 1 mile of the proposed crossing location where construction activities are also proposed. Atlantic and DETI have committed to implement various measures at ESA sensitive waterbodies to mitigate potential impacts on ESA-listed, proposed, or under review aquatic species. These measures are listed below, and referred to in the following sections as the "FWS' enhanced conservation measures." In addition to the FWS' enhanced conservation measures listed below, species-specific measures may apply, as discussed in the sections below (e.g., TOYR).

- Atlantic and DTI would alert the FWS and the appropriate state agencies when work begins in the ESA sensitive waterbodies.

- EIs would be onsite during construction activities and would have stop work authority. FERC third-party compliance monitors would also be onsite during construction, and if compliance issues are identified, would have the authority to stop work in the area until the compliance issue is resolved (see section 2.5). Atlantic and DETI would utilize species experts to conduct all require biological monitoring (e.g., species relocation) and would document and report on these activities as they are conducted.

- There would be an increased buffer between refueling/overnight equipment and vehicle parking areas at ESA sensitive waterbodies (i.e., minimum of 300-foot separation).

- Any spills within 100 feet upslope of ESA sensitive waterbodies would be reported to the appropriate FWS office within 24 hours of identification for input on species-specific mitigation.

- Atlantic and DETI would install temporary equipment crossings to reduce the potential for increased erosion and sedimentation resulting from construction equipment and vehicular traffic crossing waterbodies. These temporary crossings would be removed following construction. At ESA sensitive waterbodies, Atlantic and DETI would not utilize the one time pass allowance during clearing activities; rather, equipment would move around or pass over installed bridges to minimize in-stream impacts.

- Any loss of circulation or inadvertent returns at HDDs occurring at ESA sensitive waterbodies would be reported to the appropriate FWS field office within 24 hours of identification for input on species-specific remediation guidance.

- If an ESA sensitive waterbody must be isolated for inadvertent return clean-up efforts, pumps of sufficient capacity would be used to maintain flows downstream at the site. The appropriate FWS field office would be consulted to determine if any additional remediation measures are appropriate to minimize impacts on ESA-listed, proposed, or under review species. In the case of an inadvertent return, additional concerns from the appropriate FWS office would be obtained before drilling resumes.

- No grubbing would occur within 50 feet of ESA sensitive waterbodies between November 15 and April 1. For waterbodies requiring bridge installation during this timeframe, grubbing or grading within an approximately 25-foot area may be required through the riparian buffer to accommodate bridge installation; however, additional erosion and sediment control measures would be installed to protect the sensitive waterbody. No grubbing would take place within 50 feet of the waterbody between November 15 and April 1 at waterbodies that are not crossed by the trenchline, but within the construction workspace.

- Blasting is proposed in areas where rock may be encountered in the trenchline of ESA sensitive waterbodies. In these waterbodies, the need for blasting would be determined on a site-specific basis shortly ahead of construction at that waterbody. For all ESA sensitive waterbodies identified in appendix K determined to require blasting, a site-specific blasting plan would be prepared and submitted to the FWS and the appropriate state agency in accordance with the notification requirements prior to blasting. Atlantic has committed to conducting blasting in the dry and utilizing matting to minimize noise and vibration.

- Atlantic and DETI would use compost filter socks at the edges of workspace and access roads within 300 feet of the ESA sensitive waterbodies. The sizing of the compost filter sock would be based on industry-accepted methodology and would typically consist of a single layer of 12-inch- or 18-inch-diameter compost filter sock. Where sizing calculations suggest use of large diameter compost filter sock, a triple stack of 18-inch-diameter compost filter sock would be used.

- Atlantic and DETI would use Priority 1 (green band) belted silt retention fence to cross wetlands and waterbodies. Atlantic and DETI would conduct installation and daily inspection and maintenance of the silt fence in accordance with the site-specific construction alignment sheets prior to and during trenching operations, stockpiling of saturated trench material, lowering-in or floating the pipeline into the trench, and during backfilling of the trench to contain trench spoils and turbidity within the confines of the construction right-of-way.

- Atlantic would utilize erosion and sediment control BMPs on access roads identified in the field as having significant erosion potential within 0.25 mile of ESA sensitive waterbodies. If an access road crosses a waterbody with potentially suitable habitat for ESA-listed, proposed, or under review species and the access road requires in-stream activities for improvements, Atlantic would conduct surveys prior to any project activities. If Atlantic and DETI document ESA-listed, proposed, or under review species in the waterbody, they would not use the access road unless in-stream activities could be avoided such as through use of an existing bridge.

- ATWS would be sited at least 50 feet from ESA sensitive waterbodies, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Based on FWS recommendations, Atlantic has adopted a 100-foot ATWS setback from five North Carolina tributaries, including UNT to Fishing Creek (MPs 33.7 and 34.8), UNT to Swift Creek (MP 40.3), UNT to Tar River (MP 58.8) and UNT to Contentnea Creek (MPs 73.1, 73.2 and 73.3).

- Atlantic and DETI propose to complete waterbody crossings during low flow times of year and when weather forecasts do not predict storm events. In ESA sensitive waterbodies, Atlantic and DETI would install in-stream silt/turbidity curtains or silt fencing at non-HDD waterbody crossing locations on the downstream side of the work area as appropriate based on conditions at time of crossing.

- Atlantic and DTI would implement BIC Team incremental controls described in section 4.1.4.2 to mitigate erosion, sedimentation, and slope instability concerns within steep slope areas (defined as slopes with a minimum length of 100 feet and 30 percent or greater).

- To avoid OHV access along the pipeline rights-of way and access roads, Atlantic and DETI have committed to implementing measures such as installation of OHV barriers (e.g., signs, fences, vegetation, or boulders). Barriers would be strategically placed to present physical barriers and to erase visual cues signaling the presence of the right-of-way from the access point. Atlantic and DETI would coordinate with the appropriate landowners and/or land managing agencies to identify locations where unauthorized OHV access is most likely to occur and to develop the appropriate OHV blocking measures. At key crossing locations, such as ESA sensitive waterbodies, site-specific OHV blocking measures would be developed in consultation with the land-managing agencies and adjacent private landowners, as appropriate.

- Atlantic and DETI are proposing to use municipal water sources for all water withdrawals previously planned at ESA sensitive waterbodies except for Jackson River, James River, Appomattox River, Tar River, and Contentnea Creek on ACP, and McElroy Creek on SHP. Water used for dust control would also be appropriated from municipal sources. To minimize potential impacts of water withdrawals on ESA-listed, proposed, and under review species, Atlantic and DETI would implement the following measures at ESA sensitive waterbodies:

  - use 1 mm or smaller screens to minimize impingement/entrainment of mussel host fish species and ESA-listed, proposed and under review species;

  - limit water withdrawal to not exceed 25 percent of instantaneous flow;

  - ensure that intake velocity does not exceed 0.25 f/s;

- use floating intake structures to avoid impacts on the stream bed; and
- implement applicable TOYR.

- For water discharge:
  - algaecide would not be added to hydrostatic test water; Atlantic would use aeration to control algae in storage containers;
  - water would be discharged at a low flow rate to avoid erosion and rutting;
  - Atlantic and DETI would restore the discharge site to pre-discharge conditions if vegetation or cover/mulch/duff is removed during discharge;
  - filtration or chlorine removal methods would be used when municipal water is placed directly from the municipal source into the pipeline for use. When water is stored in aboveground containments for more than one week, the chlorine would dissipate during aeration and additional chlorine removal methods would not be needed;
  - Atlantic and DETI would not discharge into ESA sensitive waterbodies; and
  - Atlantic and DETI would discharge in upland areas a minimum of 300 feet from ESA sensitive waterbodies.

In the addition to the FWS' enhanced conservation measures listed above, **we recommend that:**

- **<u>During construction</u>, to minimize potential impacts of water withdrawals on ESA-listed, proposed, and under review species, Atlantic and DETI should limit water withdrawal to not exceed 10 percent of instantaneous flow at ESA sensitive waterbodies identified in appendix K.**

<u>Bat Species and Madison Cave Isopod</u>

Atlantic and DETI have committed to the following conservation measures that would apply to ESA-listed bat species.

- Atlantic and DETI would alert the FWS and the appropriate state agencies when work begins within 6 miles of Virginia big-eared bat hibernacula, and 5 miles of Indiana bat and northern long-eared bat hibernacula.
- Atlantic and DETI would develop site-specific blasting plans for blasting occurring within 0.5 mile of known and survey identified bat hibernacula, and would submit the plan to the FWS and the appropriate state agency in accordance with the notification requirements prior to blasting. Blasting is not currently anticipated to take place within 0.5 mile of bat hibernacula during the hibernation period.

Atlantic has developed a *Karst Mitigation Plan* (see appendix I) describing the measures that would be taken to avoid or minimize potential impacts on karst resources. However, the VDCR-DNH and Virginia Cave Board have made additional recommendations to address impacts if mitigation and protective measures fail and there is a discharge into karst waters, potentially impacting subsurface habitat, drinking water, and surface streams fed by karst springs. The FWS West Virginia and Virginia Field Offices also continue to express concern regarding the potential for trenching, blasting, and water discharge activities to impact subterranean karst features and karst waters that could indirectly impact bat hibernacula and Madison Cave isopod priority habitat.

Atlantic and DETI have consulted with the Virginia Speleological Survey, West Virginia Speleological Survey, Virginia Cave Conservancy, and Karst Waters Institute to map and identify karst features and caves along the ACP route. In addition, Atlantic has performed subsurface investigations, hydrological investigations, and dye tracing at the Cochran's Cave Conservation Area and Moffet Lake. Atlantic would provide a consolidated report of available literature regarding karst features to FERC and the appropriate federal and state agencies in June 2017. Atlantic would perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way. Atlantic would perform an ERI survey to detect subsurface solution features along all portions of the route that are mapped as limestone bedrock at the surface prior to construction, which would include surveys of karst features located within the Madison Cave isopod priority area (AP-1 MPs 123.7 through 149.6) (see section 4.7.1.13), and for karst features located within the construction workspace that are within a 5-mile buffer of currently known or survey-identified bat hibernacula (see sections 4.7.1.1 through 4.7.1.4). As discussed in section 4.1.2.3, ERI surveys are also planned for the Simmons-Mingo cave system, a known bat hibernaculum (see section 4.7.1.4) in 2019. No known Virginia big-eared bat maternity colonies are known to occur within 6 miles of the ACP route, and no gray bat maternity colonies have been identified to date (see sections 4.7.1.1 and 4.7.1.2 for more detail on potential bat maternity colonies and karst features, respectively).

As discussed in sections 4.7.1.1 through 4.7.1.4, surveys of karst features and potential bat hibernacula along the ACP route are not complete. Should these surveys confirm occupancy of bats at potential hibernacula, and/or additional karst features are identified within the construction workspace within 5 miles of known or survey identified bat hibernacula, **we recommend that:**

- **<u>Prior to construction, but following tree clearing</u>, Atlantic should:**

  a. conduct ERI and/or air track drilling surveys of karst features identified within the construction workspace that are located within 5 miles of known or survey-identified bat hibernacula based on the results of the 2017 karst and hibernacula surveys;

  b. file a report(s) documenting these surveys with the Secretary and the appropriate federal and state agencies; and

  c. if data suggests that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula and/or the Madison Cave isopod suitable habitat (based on the ERI and/or air track drilling surveys), Atlantic should consult with the FERC staff, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on these species and their habitat.

4.7.1.1 Virginia Big-eared Bat

The federally endangered Virginia big-eared bat is a medium sized cave-dwelling bat characterized by oversized ears, a dark brown pelage, and distinctive facial glands on either side of the muzzle (FWS, 2015a; VDGIF, 2016c). The species is non-migratory, occupying caves year-round, and appears to prefer well-ventilated limestone caves in karst regions with temperatures between 32 degrees Fahrenheit (°F) and 54 °F. Bats can travel short distances of up to 20 miles between their winter hibernacula and maternity colonies. Night activity levels increase drastically in July, probably due to young becoming volant. Individual bats have been observed to return to the same feeding area night after night, generally within 6 miles of occupied caves; they forage in open areas, along forest edges, and in small openings in forests, but do not use clear-cuts (Kentucky Department of Fish and Wildlife Resources [KDFWR], 2016; VDGIF, 2016c; WVDNR, 2006a). For more information on the Virginia big-eared bat's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2008 (FWS, 2008b). More Virginia big-eared bats occur in West Virginia than in any other state. *Pseudogymnoascus destructans*, the fungus that causes WNS has been detected on this species, but there has been no mortality reported to date. In fact, recent counts for the species appear to show numbers slightly increasing (Stihler, 2014), with 2016 summer counts and 2017 hibernacula counts being the highest recorded to date in West Virginia (WVDNR, unpublished data).

The Virginia big-eared bat is known to occur in Randolph County, West Virginia, and Highland and Bath Counties, Virginia. It is not known to occur in counties associated with the proposed SHP route. Species occurrence is based on a desktop review using the FWS Information for Planning and Conservation (IPaC) website. The Virginia WERMS data identified two potential hibernacula within 6 miles of ACP. There are no documented maternity colonies located within 6 miles of ACP. Three caves designated as critical habitat are present in Pendleton, West Virginia: Sinnit-Thorne Cave, Hoffman School Cave, and Hellhole Cave that lie approximately 15, 20, and 33 miles from the proposed ACP route, respectively and, therefore, would not be affected.

Atlantic and DETI developed study plans for the Virginia big-eared bat in coordination with the FWS field offices in West Virginia and Virginia, and the GWNF and MNF. Virginia big-eared bats were identified at two acoustic sites in Augusta County, Virginia. No Virginia big-eared bats were captured during mist-netting efforts.

Data were reviewed from the WVDNR and the West Virginia and Virginia Speleological Societies, in addition to 2016 surveys, to identify known Virginia big-eared bat hibernacula within 6 miles of ACP. There are two known Virginia big-eared bat hibernacula within 6 miles of ACP (see table 4.7.1-2).

TABLE 4.7.1-2

Known Virginia Big-Eared Bat Hibernacula within 6 Miles of the Atlantic Coast Pipeline [a]

County, State	Hibernaculum Name	Approximate Distance to Workspace (miles) [b]	Priority Number [c]	Max Population Estimate 2000-2007
Highland, VA	Breathing Cave [d]	2.3 (AR)	NA	NA
Bath, VA	Better Forgotten Cave [d]	2.4 (AR)	NA	NA

[a] There are no known Virginia big-eared bat hibernacula within 6 miles of SHP.
[b] AR – Access Road
[c] Priority 1 is highest priority, and most essential to recovery of the species. Priority 4 is least important to recovery (FWS, 2007a).
[d] Sites found in the Virginia WERMS, but not present in NHI or tabular data provided by the state and the FWS Virginia Field Office; these records may include incidental reports by cavers.

Atlantic identified potential bat hibernacula based on features identified through desktop review, roadside and pedestrian surveys, and 2016 karst surveys. Harp trapping and/or acoustic surveys were conducted at hibernacula determined by Phase 1 surveys to be potentially suitable. There are 21 potential hibernacula within 1 mile of the ACP construction workspace that could serve as habitat for the Virginia big-eared bat (see table 4.7.1-3). No Virginia big-eared bats were detected or captured at these sites. Occupancy surveys are planned in 2017 for six remaining suitable hibernacula. Additionally, 46 acoustic sites surveys, 60.7 acres of pedestrian hibernacula surveys, and surveys at 11 potential hibernacula locations (Phase 1 surveys) remain to be completed.

TABLE 4.7.1-3

Potential Bat Hibernacula Identified within 1 Mile of the Atlantic Coast Pipeline [a]

County, State	Approximate Distance to Workspace (miles) [b]	Unique Identifier	Potential Hibernacula Description [c]	Survey Type / Result
Upshur, WV	0.00	Portal 2	Horizontal passage	Harp Trap and Acoustic Surveys / No bat captured or detected
Randolph, WV	<0.1 (AR)	Falling Spring Cave	Horizontal passage	Harp Trap and Acoustic Survey / No bats captured or detected
Randolph, WV	0.3 (AR)	PH-S003	Crack or crevice	Suitable Phase 1, Phase 2 not conducted due to access restrictions
Randolph, WV	0.4	PH-S014 / Simmons-Mingo Cave [d]	Large entrance to natural cave / main entrance in Randolph County of several known entrances	Harp Trap and Acoustic Survey / Northern long-eared bat captured
Randolph, WV	0.2 (AR)	PH-S018	Vertical pit	Acoustic Survey / Northern long-eared bat detected [e]
Randolph, WV	0.7	Eb's Cave	N/A	Mist-net Survey / Tri-colored bats observed during winter surveys
Randolph, WV	0.3	Waterfall Cave	N/A	Mist-net Survey / Tri-colored bats observed during winter surveys
Pocahontas, WV	0.1 (AR)	PH-S005	Horizontal passage	Suitable Phase 1, Phase 2 survey not conducted due to access restrictions
Pocahontas, WV	0.1 (AR)	PH-S006	Crack or crevice	Suitable Phase 1, Phase 2 survey not conducted due to access restrictions
Pocahontas, WV	<0.1	Bathtub Cave	Horizontal passage with heavy airflow	Harp Trap and Acoustic Survey / No bats captured or detected
Pocahontas, WV	<0.1	High Up Hole #1 / High Up Hole #2	Connected entrances; portals within sinkhole	Harp Trap and Acoustic Survey / No bats captured
Pocahontas, WV	0.2 (AR)	PH-S007 / PH-S008	Connected entrances; PH-S007 is a horizontal passage	Acoustic Survey / Northern long-eared bats detected [e]
Pocahontas, WV	0.0	Tapps Trap	Small vertical pit	Acoustic Survey / No bats detected
Pocahontas, WV	0.2	Piddling Pit	Vertical pit	Suitable Phase 1, Phase 2 survey not conducted due to seasonal survey restrictions
Pocahontas, WV	0.1	PH-S001 / Canis Majoris Cave	Horizontal passage	Suitable Phase 1, Phase 2 survey not conducted due to access restrictions
Pocahontas, WV	0.4	PH-S019	Horizontal passage	Harp Trap and Acoustic Survey / Northern long-eared bats detected [e]
Highland, VA	0.0	Rockwell Cave	Vertical pit	Acoustic Survey / No bats detected
Highland, VA	0.7	Dever Cave	N/A	Harp Trap and Acoustic Survey/ No bats captured; no listed bat species detected; little brown bat detected
Augusta, VA	<0.1	Cochran's Cave #3	Vertical pit	Acoustic Survey / No bats detected

TABLE 4.7.1-3 (cont'd)

Potential Bat Hibernacula Identified within 1 Mile of the Atlantic Coast Pipeline [a]

County, State	Approximate Distance to Workspace (miles) [b]	Unique Identifier	Potential Hibernacula Description [c]	Survey Type / Result
Augusta, VA	<0.1	Cochran's Cave #2	Vertical pit	Acoustic Survey / No bats detected
Bath, VA	0.5	Jewel Box Cave	N/A	Acoustic Survey / No high frequency bats detected

[a] No potential bat hibernacula was identified within 0.5 miles of SHP.
[b] AR – Access Road
[c] Indiana bat, northern long-eared bat, Virginia big-eared bat, or gray bat may all potentially use these sites as hibernacula.
[d] Simmons-Mingo Cave is a known cave to the West Virginia Speleological Society and WVDNR. It is a known bat hibernaculum for Indiana bat. Harp trap surveys in September 2016 confirmed the continued use of the site by northern long-eared bats.
[e] Recorded calls at these sites are diagnostic for northern long-eared bat, but the acoustic signature of bats emerging from roosts are different than typical search phase calls and contain greater overlap between species. Therefore, the calls recorded may represent search phase calls of northern long-eared bats or emergence-type calls of other Myotis species (e.g., little brown bat or Indiana bat).

Impacts resulting from construction activities on hibernacula could include destruction of habitat, or alteration of cave hydrology and/or microclimate. Ground-disturbing activities near cave entrances could impact cave habitats connected to hibernation areas by creating additional openings or altering the cave structure, which may render the hibernacula unsuitable to bats. If construction activities uncover previously unidentified hibernacula during hibernation, it could result in direct mortality of individuals, or cause bats to relocate, which could result in starvation or death. Noise emissions and vibrations resulting from construction activities or aboveground facility operation in proximity to hibernating or roosting bats could also wake bats from hibernation, cause bats to avoid certain areas, or alter foraging behaviors and habitat use (Bunkley et al., 2015).

Based on table 4.7.1-2 there are two known Virginia big-eared bat hibernacula within 6 miles of the ACP construction workspace. A total of 60.7 acres of pedestrian hibernacula surveys, and surveys at 11 potential hibernacula locations (Phase 1 surveys) remain to be completed. If a new hibernaculum is identified during surveys, the route would be adjusted to avoid direct impacts on the hibernaculum. Improvements to access roads would not occur if those activities would negatively impact a karst feature where and mitigation/remediation measures cannot be applied. As discussed in section 4.7.1, the FWS has expressed concern regarding impacts on potentially connected subsurface karst systems located upstream of bat hibernacula that could cause changes to structure, hydrology, and/or hibernacula microclimate that could make bat hibernacula unsuitable, and/or disrupt hibernating bats, leading to mortality.

To minimize impacts on potential hibernacula, Atlantic has prepared and would implement a *Karst Mitigation Plan* (see appendix I), which identifies measures for avoiding or minimizing impacts on karst features during construction, which could be used as bat hibernacula or shelter. In addition, in section 4.7.1 we recommend ERI and/or air track drilling surveys of karst features identified within the construction workspace that are located within 5 miles of known or survey-identified bat hibernacula based on the results of the pending 2017 karst and hibernacula surveys. Based on the ERI and/or air track drilling surveys, if data suggest that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula, we recommend that Atlantic consult with the FERC, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on these species and their habitat.

As discussed above, Virginia big-eared bats typically forage within 6 miles of occupied caves and tend to use the same areas on a regular basis. Virginia big-eared bats utilize open areas including forest edges as foraging habitat. Clearing of the construction workspace would create a forest edge, which could be used as foraging habitat by this species; therefore, tree clearing in the ACP construction workspace within 6 miles of the three known Virginia big-eared bat hibernacula identified in table 4.7.1-2 is not anticipated to substantially affect forage habitat availability for this species. In addition, Atlantic would avoid clearing forested habitat occupied by Indiana bats (see section 4.7.1.3) from April 1 to November 14 to avoid impacts on roosting or foraging bats, which would also avoid disturbance to foraging Virginia big-eared bats in these areas. Outside of the Indiana bat occupied habitat, Atlantic would avoid clearing during the migratory bird season (April 1 to August 30), which could also help protect foraging Virginia big-eared bats.

Blasting and other construction or operational noises may impact protected bat species if the hibernacula or roosting areas occur within the action area and are in use at the time of construction activities. Blasting could impact bats by causing rocks to fall or mines to collapse that would injure, kill, or trap hibernating bats, or by causing bats to awaken during hibernation, decreasing their fitness by causing them to deplete their limited fat reserves prematurely. The potential for blasting to disturb hibernating bats depends on the distance of the bats from the blast source. Published literature indicates that ground vibration of approximately 12 inches per second are required to cause rocks to fall in unlined tunnels (FWS, 2005a). Although relatively little research has been done, the available literature suggests that hibernating bats can withstand vibration levels of 0.06 to 0.2 inch per second without adverse effects. Underground measurements at bat roost locations in Hellhole Cave, West Virginia suggested that vibrations where bats roosted were 1.33 to 2.76 times less than surface measurements (WVDEP, 2006b). For each area determined to require blasting, a site-specific blasting plan prepared by the construction contractor would be submitted to Atlantic or DETI for approval. If a blasting plan is developed for an area within 0.5 mile of known Virginia big-eared bat hibernacula, Atlantic would coordinate with the FWS. Blasting is not currently proposed within 0.5 mile of bat hibernacula during the hibernation period.

Atlantic would burn cleared vegetation and stumps if it is infeasible to haul chips off the right-of-way, except on NFS land where burning is prohibited. Depending on weather and airflow conditions, smoke and noxious fumes may enter caves or hibernacula, causing roosting and hibernating bats to arouse and flush, which may increase energy expenditure and possibly reduce fitness (Perry, 2011; Dickinson et al., 2009). Fire near caves or hibernacula may alter the vegetation structure near entrances, possibly impacting the microclimate (i.e., temperature and humidity regimes) of these areas (FWS, 2016a). Atlantic would not conduct burning activities within 500 feet of occupied hibernacula (if any are identified in subsequent surveys) and would implement the measures outlined in its *Fire Plan* and *Open Burning Plan* (see table 2.3.1-1), which includes coordination with state forests.

Noise and lights associated with nighttime construction activities when bats are foraging (e.g., HDD, facility construction) may affect protected bat species, particularly in areas of limited habitat where bat colonies are already stressed. This disruption may lead to reduced fitness for both adult female bats and their young. Impacts associated with noise and lights associated with nighttime construction activities when bats are foraging (e.g., HDD, facility construction) would be temporary in nature, and no negative long-term population effects are expected due to the light and noise disturbance at night.

Conservation measures specific to occupied bat habitat and bat hibernacula would be further refined and defined upon FWS review of survey results, when impacts can be further quantified. Based on currently available data, ACP *may affect* the Virginia big-eared bat; however, ACP is *not likely to adversely affect* the Virginia big-eared bat. Given that the closest designated critical habitat is 15 miles from the ACP project area, ACP would have *no effect* on Virginia big-eared bat critical habitat. FERC and FWS will re-evaluate this determination upon receipt of pending survey results and proposed conservation measures.

National Forest System Lands

Virginia big-eared bats were not detected during acoustic surveys on NFS lands in 2015 or 2016, nor were any captured over the course of mist-net surveys conducted on the MNF in 2015 or 2016. Pedestrian hibernacula surveys on the MNF are complete and no suitable hibernacula were identified. Atlantic detected Virginia big-eared bats at one acoustic site on the GWNF in 2015; however, none were captured during mist-net surveys in 2015 or 2016 and none were detected during acoustic surveys in 2016. No cave or portal openings likely to support bats were found on the GWNF; however, there are known caves associated with the Virginia big-eared bats within 5 miles of the proposed ACP centerline in Virginia. There are six mist-net sites on the MNF and eight acoustic sites on the GWNF that remain to be surveyed in 2017.

Direct and indirect effects of ACP on Virginia big-eared bats, and the conservation measures that would be implemented described above also apply on NFS lands. Cumulative effects of ACP are discussed in section 4.13. Atlantic is consulting with the MNF and GWNF regarding revegetation and seeding requirements for permanent easements and temporary construction rights-of-way on federally managed lands, which will be provided in the final *COM Plan* (see appendix G) prior to construction. In addition to the conservation measures described above, Atlantic has committed to the following conservation measures on NFS lands that would further reduce adverse impacts to this species:

- Atlantic would replant all ATWS and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, with a combination of indigenous tree and shrub seedlings on NFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the FS;
- The right-of-way edges would be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public; and
- Atlantic would employ the least-intrusive tree removal methods to reduce damage to the adjacent forest.

To avoid potential adverse impacts on wildlife and wildlife habitat, the FS has recommended no burning on NFS lands. Large woody debris from cleared vegetation and stumps would be placed along the edge of the right-of-way to minimize the potential for soil erosion and sedimentation. The material would be placed in a manner that would not impede natural drainage, and gaps would be left at intervals to provide passage for wildlife and human uses on NFS land. If any cleared vegetation must be chipped on-site, Atlantic would haul chips off the right-of-way to a disposal site off NFS land. Atlantic will work with the FS to finalize the *COM Plan* with this requirement.

4.7.1.2 Gray Bat

The federally endangered gray bat is a medium sized cave-dwelling bat characterized by a dark gray, monochromatic pelage. Except for rare instances, the gray bat can be found in caves year-round. They choose deep vertical caves for winter hibernation, and move to caves along rivers in summer. This species can travel up to 270 miles between summer and winter habitats, using smaller caves during transit (FWS, 2016b). Gray bats forage along streams and in wooded riparian areas, usually between 0.6 and 2.5 miles from maternity caves; aquatic insects make up most of the adult gray bat diet. Juveniles have been found to forage more in woodland areas and consume more beetles than adult gray bats (Brack and LaVal, 2006; Kentucky Bat Working Group [KBWG], 2016).

The range of the gray bat is tied to the limestone karst region of the southeastern United States. Due to the species' habit of living in large numbers in few caves, the gray bat is extremely susceptible to disturbance, particularly in their winter hibernacula. Loss of habitat also poses a threat, due to flooding of caves during dam and reservoir construction, or changes to caves to grant or prevent access that disrupt temperature, air flow, and humidity (FWS, 2016b). For more information on the gray bat's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2009 (FWS, 2009a).

The only county crossed by ACP where the gray bat is known to occur is Bath County, Virginia. The species is not known to occur in counties associated with the proposed SHP. Species occurrence is based on a desktop review using the FWS IPaC website and on consultations with the FWS and VDGIF. The nearest documented occurrence is approximately 7.2 miles from the ACP route in Appomattox County, Virginia. There are no documented maternity colonies located within 5 miles of the ACP route. In September 2016, the West Virginia FWS Field Office announced a new record for the species in West Virginia. The species was captured in Logan County, West Virginia, and is considered by the FWS to potentially be present in Logan County and adjacent counties.

A gray bat individual was detected during acoustic surveys at one site in Nottoway County, Virginia, which may indicate gray bats foraging; however, gray bats are not known from Nottoway County, and additional information would be needed to document an expansion of its range. Acoustic surveys did not target this species specifically, and there is no approved survey method for this species; follow-up mist-net surveys were not completed for this site. No gray bats were detected or captured in 2016.

Atlantic identified potential bat hibernacula based on features identified through desktop review, roadside and pedestrian surveys, and 2016 karst surveys. Harp trapping and/or acoustic surveys were conducted at all sites identified as potential hibernacula. There are 21 potential hibernacula within 1 mile of the ACP construction workspace that could serve as habitat for the gray bat (refer to table 4.7.1-3). Gray bats were not captured or detected at any of these sites. Surveys at 25 acoustic sites remain to be completed in Bath County, Virginia.

Because the gray bat uses similar habitat as the Virginia big-eared bat, the impact analysis and conservation measures described in section 4.7.1.1 would also generally apply, including the discussion on potential impacts associated with hibernacula, blasting, noise emissions and vibrations, and lights. The impact analysis and conservation measures that are unique or differ from the Virginia big-eared bat are described below.

Based on review of agency data and 2016 karst surveys, there are no known caves used by gray bats located within 5 miles of the ACP project area. If a new hibernaculum is identified during surveys, the route would be adjusted to avoid direct impacts on the hibernaculum. Improvements to access roads would not occur if those activities would negatively impact a karst feature, and mitigation/remediation measures are not applicable. The FWS has expressed concern regarding impacts on potentially connected karst systems located upstream of bat hibernacula that could cause changes to structure, hydrology, and/or hibernacula microclimate that could make bat hibernacula unsuitable, and/or disrupt hibernating bats, leading to mortality.

To minimize impacts on potential hibernacula, Atlantic has prepared and would implement a *Karst Mitigation Plan* (see appendix I), which identifies measures for avoiding or minimizing impacts on karst features during construction, which could be used as bat hibernacula or shelter. In addition, in section 4.7.1 we recommend ERI and/or air track drilling surveys of karst features identified within the construction workspace that are located within 5 miles of known or survey-identified bat hibernacula based on the results of the pending 2017 karst and hibernacula surveys. Based on the ERI and/or air track drilling surveys, if data suggest that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula, we recommend that Atlantic consult with the FERC, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts to these species and their habitat.

As discussed above, gray bats forage along riparian corridors. Fragmentation of riparian habitat used for foraging may contribute to population declines of the gray bat. Additionally, a reduction in the amount of foraging habitat available in the general vicinity of roosting areas, if substantial, could alter use patterns in an area or preclude use of an area altogether. As described in Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F), Atlantic would restore riparian areas with native species across the entire width of the construction corridor. Forested riparian areas would be restored and enhanced using plantings of native trees and shrubs, excluding the permanent easement. Restoration of riparian areas would be designed to restore stream bank integrity, withstand periods of high flow, and would include temporary erosion control fencing until restoration is complete. With the implementation of these conservation measures, in addition to the measures described in section 4.7.1.1, and considering that there are no known gray bat hibernacula within 5 miles of the ACP construction workspace, tree clearing in the ACP construction workspace is not anticipated to substantially affect forage habitat availability for this species.

Based on currently available data, ACP *may affect* and is *not likely to adversely affect* the gray bat. FERC and FWS will re-evaluate this determination upon receipt of pending survey results and proposed conservation measures.

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Gray bats were not detected or captured during surveys on the GWNF in 2015 or 2016, and no cave or portal opening likely to support bats were found on the GWNF. There is limited suitable foraging habitat for this species within the ACP construction workspace on the GWNF (see section 4.4.6). With the implementation of the conservation measures identified above, in addition to the conservation measures described under section 4.7.1.1 for NFS lands, tree clearing in the ACP construction workspace is not anticipated to substantially affect forage habitat availability for this species on the GWNF. There are eight acoustic sites on the GWNF that remain to be surveyed in 2017.

4.7.1.3 Indiana Bat

The federally endangered Indiana bat is a small (1.5 to 2.0 inches long and wingspan of 9.5 to 10.5 inches) brown bat found throughout the eastern half of the United States.

The Indiana bat is migratory, using significantly different winter and summer habitats. Winter habitats include mines, caves, and karst areas of the eastern U.S. where the bats hibernate from October through April. For hibernation, they require cool, humid habitat with stable temperatures, under 50 °F, but above freezing. The hibernacula typically contain large numbers of bats and often have large rooms and vertical or extensive passages. Swarming typically occurs during the fall, where individuals swarm in and out of cave entrances from dusk to dawn. Individuals often use the habitat surrounding hibernacula in the spring during emergence to feed and increase body weight (FWS, 2007a). Since the onset of WNS, populations of this endangered species have declined rapidly in the region. West Virginia hibernacula surveys indicate that populations have decreased by over 95 percent, with declines continuing in 2017 (a further 50 percent decline of remaining individuals in caves [WVDNR, unpublished data]).

When active, the Indiana bat roosts in dead trees, dying trees, or live trees with exfoliating bark. During the summer months, most reproductive females occupy roost sites that receive direct sunlight for more than half the day. Roost trees are generally found within canopy gaps in a forest, fence line, or along a wooded edge. Maternity roosts are found in riparian zones, bottomland and floodplain habitats, wooded wetlands, as well as upland communities. Indiana bats forage in semi-open to closed forested habitats, forest edges, and riparian areas. Indiana bats exhibit fidelity to their summer habitats, returning to the same foraging and roosting areas each year (FWS, 2007a). For more information on the Indiana bat's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2009 (FWS, 2009b).

The Indiana bat has the potential to occur in Harrison, Lewis, Upshur, Randolph, and Pocahontas Counties, West Virginia, and may also occur in Highland, Bath, Augusta, and Rockbridge Counties, Virginia. Species occurrence is based on a desktop review using the FWS IPaC website and on consultations with the FWS. Designated critical habitat for the Indiana bat is located approximately 33 miles from the ACP route at Hellhole Cave in Pendleton, West Virginia and, therefore, would not be impacted. ACP crosses several Indiana bat hibernacula protection areas in Pocahontas and Randolph counties, West Virginia. Known Indiana bat maternity activity is documented in Wetzel County, West Virginia (FWS, 2013a), and West Virginia NHI data identify seven locations with occurrences of Indiana bat within 5 miles of ACP in Pocahontas and Randolph Counties. The FWS Virginia Field Office has confirmed Indiana bat habitat within 5 miles of ACP (FWS, 2015c and 2017a), and the Virginia WERMS data indicate occurrences of Indiana bat at five locations in Bath and Highland Counties. Suitable foraging and roosting habitat also occurs throughout the MNF.

This species has the potential to occur in counties along the SHP route, including Westmoreland and Greene Counties, Pennsylvania, and Harrison, Lewis, Doddridge, Tyler, Wetzel, and Marshall Counties, West Virginia. West Virginia NHI data indicate summer roosting and foraging habitat in Wetzel County; the 5-mile buffer of this occurrence overlaps with SHP in Wetzel and Tyler Counties. Known maternity colonies and/or male capture sites are documented in Greene County, Pennsylvania. No known hibernacula protection areas are found along the proposed SHP route.

Atlantic and DETI developed study plans for listed bat species in coordination with the FWS Field Offices in Pennsylvania, West Virginia, Virginia, and North Carolina, and the GWNF and MNF. Table 4.7.1-4 lists the number and locations of the Indiana bat that were detected during Atlantic's surveys in 2015 and 2016, by state and county. Atlantic conducted acoustic surveys along the ACP route in 2015 and 2016. Indiana bats were detected at a total of two sites in West Virginia, 12 sites in Virginia, and 27 sites in North Carolina. There were no positive detections of the Indiana bat within the SHP survey area. Mist-net surveys were conducted in 2016 at all sites with positive acoustic detections from 2015 surveys; no Indiana bats were captured during 2016 mist-netting efforts. Surveys at 80 acoustic sites and 9 mist-net sites remain to be completed.

Winter acoustic surveys were also conducted in North Carolina to determine bat activity outside of the summer period. Of the 25 acoustic sites, potential Indiana bats were detected at eight sites as early as March 7, 2016; however, only three sites detected potential Indiana bat calls for more than one night of survey. It is possible that the acoustic surveys detected southeastern bats or little brown bat calls that were attributed to Indiana bat. Bat activity appeared to correlate with temperature, with more than two-thirds of positive site nights having a minimum temperature of 50 °F; southeastern bats may be more active at the end of the winter season.

TABLE 4.7.1-4		
2015 and 2016 Summary of Indiana Bat Acoustic Survey Results (Sites with Occurrences) for the Atlantic Coast Pipeline		
State	County	Number of Positive Acoustic Sites [a]
West Virginia	Pocahontas	2 [b]
Virginia	Highland	1
	Augusta	2
	Brunswick	2
	Greensville	1
	Southampton	2 [b]
	Suffolk	4
North Carolina [c]	Northampton	6
	Halifax	7
	Nash	11
	Wilson	2
	Cumberland	1 [b]
Total Occurrences		**41**

a Acoustic occurrences include acoustic detections that reverted to probable absence due to negative mist net survey results.
b Count includes sites with acoustic positive results for Indiana bat where follow-up mist net surveys could not be completed in 2016. These sites will receive follow-up mist net surveys in 2017, and if net surveys are negative probable absence will be concluded.
c Positive acoustic results in North Carolina in 2015 are potentially false positives. Negative mist net surveys conducted at these sites in 2016 indicate unoccupied habitat.

Data were reviewed from the WVDNR and the West Virginia and Virginia Speleological Societies, in addition to 2016 surveys, to identify known bat hibernacula within 5 miles of ACP. There are seven known Indiana bat hibernacula within 5 miles of ACP workspace in West Virginia and five in Virginia; two are located within 0.5 mile of ACP (refer to table 4.7.1-5).

TABLE 4.7.1-5				
Known Indiana Bat Hibernacula within 5 Miles of the Atlantic Coast Pipeline [a]				
County, State	Hibernaculum Name	Approximate Distance to Workspace (miles) [b]	Priority Number [c]	Max Population Estimate 2000-2007
Randolph, WV	Gooseberry Cave	1.6 (CY)	4	0
Randolph, WV	Fortlick Cave	2.5 (CY)	3	109
Randolph, WV	Stewart Run Cave	4.9 (CY)	3	40
Pocahontas, WV	Dreen Cave	0.7 (AR)	4	0
Randolph, WV	Falling Spring Cave	<0.1 (AR)	4	49
Randolph, WV	Simmons-Mingo Cave [e]	0.3	4	0
Pocahontas, WV	Cass Cave	4.4	4	0
Bath, VA	Starr Chapel Saltpeter Cave	2.0 (AR)	3	67
Bath, VA	Mountain Grove Saltpeter Cave	3.4 (CY)	4	2
Bath, VA	Breathing Cave [d]	2.3 (AR)	NA [f]	NA
Bath, VA	Clarks' Cave [d]	3.1 (AR)	NA [f]	NA
Bath, VA	Witheros Cave [d]	4.7	NA [f]	NA

a There are no known Indiana bat hibernacula within 5 miles of SHP.
b CY – Contractor Yard, AR – Access Road.
c Priority 1 is highest priority, and most essential to recovery of the species. Priority 4 is least important to recovery (FWS, 2007a).
d Sites found in the Virginia WERMS, but not present in NHI or tabular data provided by the state and the FWS Virginia Field Office; these records may include incidental reports by cavers.
e Northern long-eared bat captures reported at this site during 2016 surveys.
f Sites not listed in FWS, 2007a.

Atlantic identified potential bat hibernacula based on features identified through desktop review, 2015 roadside and pedestrian surveys, and 2016 karst surveys. Harp trapping and/or acoustic surveys were conducted at all sites identified as potential hibernacula during the fall emergence survey window as determined by Phase 1 field assessments. There are 21 potentially suitable hibernacula within 1 mile of the ACP construction workspace that could serve as habitat for the Indiana bat (refer to table 4.7.1-3). Indiana bats were not captured or detected during harp trap and/or acoustic surveys at any of the potential hibernacula sites; however, northern long-eared bats were identified at four sites located within 0.5 mile of the ACP workspace (this includes the Simmons-Mingo Cave, a known Indiana bat hibernaculum). The presence of these species suggests an increased likelihood of hibernacula suitability for the Indiana bat. No portals or caves were identified as suitable habitat for Indiana bat along SHP. Occupancy surveys are planned in fall 2017 for 23 remaining suitable hibernacula. Additionally, a total of 210.0 acres of pedestrian hibernacula surveys and 49 potential hibernacula location (Phase 1) surveys remain to be completed.

Surveys for potential roost trees were conducted in West Virginia where the ACP project area intersects known Indiana bat habitats. These included areas within the 5-mile buffer of a known Indiana bat roost tree or hibernaculum; and within the 5-mile buffer of a known Indiana bat capture. Buffer distances were based on WVDNR known occurrences and survey data, and MNF long-term mist-net data. Potential roost tree surveys in 2015, 2016, and 2017 identified a total of 2,248 roost trees including 251 primary and 2,033 secondary roost trees within the ACP workspace. Seventy-eight primary roost trees and 562 secondary roost trees were identified within the SHP workspace in 2015, 2016, and 2017. Primary roost trees are more likely to support a maternity colony than secondary roost trees; however, it should be noted that live shagbark hickory trees greater than 5 inches in diameter, often used by Indiana bats for roosting, were generally not identified as primary roost trees in this survey. A total of 92.4 acres of surveys for potential roost trees remain to be completed.

Atlantic and DETI would clear occupied forested habitat during the winter season, as defined in table 4.7.1-6, when Indiana bat are hibernating and not present on the landscape.

TABLE 4.7.1-6

Indiana Bat and Northern Long-eared Bat Winter Tree Clearing Window

State	Winter Tree Clearing Timeframe (Non-Active Bat Season)
Virginia	Known hibernacula within 5 miles: November 16-March 31 No known hibernacula within 5 miles: September 16-April 14
West Virginia	November 16-March 31
North Carolina	November 16-March 31

Occupied Indiana bat habitat is defined as:

- 5-mile radius of female and juvenile mist-net capture locations;
- 5-mile radius of priority 3 and 4 bat hibernacula;
- 10-mile radius of priority 1 and 2 bat hibernacula; and
- 2.5-mile radius of Indiana bat roosts.

For the purposes of this EIS, occupied Indiana bat habitat was calculated based on a 5-mile buffer around:

- known Indiana bat occurrences provided by agencies (there were no mist net captures of Indiana bat during 2015 and 2016 Atlantic and DETI surveys); and

- known priority 3 and 4 bat hibernacula (refer to table 4.7.1-5; there are no priority 1 or 2 sites identified within 5 miles of ACP or SHP).

Table 4.7.1-7 provides the acres of occupied forested Indiana bat habitat that would be affected by construction. The total acreage of potentially suitable habitat that would be cleared is 2,674 acres on ACP, and 478 acres on SHP.

TABLE 4.7.1-7

Summary of Impacts on Indiana Bat Habitat for the Atlantic Coast Pipeline and Supply Header Project [a]

County, State	Site ID	Total Acreage of Forested Occupied Indiana Bat Habitat within 5 miles of Known Indiana Bat Hibernacula Buffers or Captures [a, b, c]	Acres of Occupied Forested Indiana Habitat Affected by Construction	Percent of Occupied Forested Indiana Bat Habitat Affected by Construction
ATLANTIC COAST PIPELINE				
Randolph, WV	Gooseberry Cave	42,614	32	<0.1
Randolph, WV	Fortlick Cave	46,817	142	0.3
Randolph, WV	Stewart Run Cave	46,985	2	<0.1
Pocahontas, WV	Dreen Cave	46,454	209	0.4
Randolph, WV	Falling Spring Cave	46,413	214	0.5
Randolph, WV	Simmons-Mingo Cave	45,489	209	0.5
Pocahontas, WV	Cass Cave	43,602	48	0.1
Bath, VA	Starr Chapel Saltpeter Cave	44,849	96	0.2
Bath, VA	Mountain Grove Saltpeter Cave	44,718	8	<0.1
Highland, VA	Breathing Cave	41,097	189	0.5
Bath, VA	Clarks' Cave	42,869	141	0.3
Bath, VA	Clarks' Cave	42,869	141	0.3
Bath, VA	Witheros Cave	41,818	14	<0.1
SUPPLY HEADER PROJECT				
Doddridge/Wetzel, WV	Occupied Summer Habitat	45,609	132	0.3
	Total	579,334	1,436	0.2

a Based on GAP data.
b Known bat hibernacula identified in table 4.7.1-5 and occurrence data provided by the agencies (no Indiana bats were captured during 2015 or 2016 mist net surveys).
c Areas where positive acoustic surveys were followed by negative mist-net surveys are not considered occupied habitat.

To avoid direct impacts on Indiana bats, Atlantic and DETI would conduct site preparation and tree clearing activities between November 16 and March 31 (see table 4.7.1-6), which avoids the summer roosting, fall swarming, and spring emergence periods. No direct impacts on summer roosting, swarming, or emerging bats using trees for roosts are anticipated from tree clearing activities.

No active maternal colony roost trees were identified during surveys in the action area, and no known roost sites within the ACP or SHP project area were identified by the agencies. However, tree clearing within the occupied habitat area could cause the loss of unknown maternity roost trees. Indiana bat maternity colonies' fidelity to their summer range is well documented. Maternity colonies use a minimum of 8 to 25 different trees in one season; although 1 to 3 trees are used as primary roosts by most bats for part or all summer. Indiana bat roost tree condition changes seasonally, and as previously used roost trees are lost due to human disturbance or natural events (e.g., wind damage), Indiana bats would locate alternate roost trees. While this is a natural phenomenon that Indiana bats must deal with regularly, the loss of multiple roosts likely stresses individual bats, affects reproductive success, and impacts the social structure of the colony (FWS, 2012a and 2016c).

As described in table 4.7.1-7, ACP and SHP would affect 1,436 acres of occupied forested Indiana bat habitat, which is approximately 0.2 percent of the total amount of occupied forested habitat available calculated based on 5 mile buffers around known Indiana bat occurrences and bat hibernacula within the vicinity of the ACP and SHP project area. The total percent change in the amount of forested habitat in the occupied area is not expected to produce a measurable response from Indiana bats in terms of changes to foraging or travel habits. The loss of potential roosting habitat because of ACP and SHP construction may impact bat species over the long term. Although some potential roost trees would be removed from the area during construction, suitable potential roost trees would remain within the uncut portions of ACP and SHP project areas. In those areas retained as forest, it is anticipated that potential roost trees would be available for future occupation by protected bat species.

Fragmentation of forested habitat used for foraging or migration by the Indiana bat may impact the protected bat species. A reduction in the amount of forested habitat available in the general vicinity of roost trees or foraging areas could alter use patterns in an area or preclude use of an area altogether. Even marginally suitable fragmented forest can become important habitat to listed bat species as undisturbed or less fragmented forests become less available (Medlin et al., 2010; Gorresen and Willig, 2004). Forest structure and fragmentation studies conducted in Missouri Ozark forests found that in areas dominated by forest cover, nonforest areas may provide landscape heterogeneity fulfilling some habitat requirement not provided in a fully forested landscape for Indiana bats. The study also suggests that the retention of large-diameter snags (greater than 30 centimeters diameter at breast height) may provide valuable roosting habitat for Indiana bat (Yates and Muzika, 2006). ACP and SHP would cause permanent fragmentation and edge effects in forested areas; however, the permanent right-of-way could also create a travel corridor for Indiana bats flying between summer roost sites and foraging areas, similar to their use of riparian corridors (FWS, 2016).

Although tree clearing would not take place during the fall swarming or spring emergence periods, the removal of forested habitat surrounding the hibernacula could affect fall swarming and spring emergence activities including the availability of nearby roost trees and foraging resources. Depending on the proximity of the clearing activities to hibernacula openings, the loss of such resource availability during the periods when caloric intake is critical to bats either preparing to enter hibernation or attempting to recover from the effects of WNS when emerging from hibernacula in the spring, the fitness of individual bats may be reduced (FWS, 2012a). Construction activities occurring within 5 miles of the 12 known Indiana bat hibernacula (see table 4.7.1-5) could also cause individuals to avoid these hibernacula, which could also reduce species fitness by interrupting breeding during fall swarming.

Impacts resulting from construction activities on hibernacula could include destruction of habitat, or alteration of cave hydrology and/or microclimate. Ground-disturbing activities near cave entrances could impact cave habitats connected to hibernation areas by creating additional openings or altering the cave structure, which may render the hibernacula unsuitable to bats. If construction activities uncovered previously unidentified hibernacula during hibernation, it could result in direct mortality of individuals or cause bats to relocate which could result in starvation or death. Noise emissions and vibrations resulting from construction activities or aboveground facility operation in proximity to hibernating or roosting bats could also wake bats from hibernation, cause bats to avoid certain areas, or alter foraging behaviors and habitat use (Bunkley et al., 2015).

As described in table 4.7.1-5, there are two known Indiana bat hibernacula located within 0.5 mile of ACP (Falling Spring Cave and Simmons-Mingo Cave/PH-S014). Falling Spring Cave, a priority 4 known Indiana bat and northern long-eared bat hibernaculum, is located adjacent to a public road that would be used as an access road; however, no vegetation clearing would occur at this site. If improvements are required along this access road they would be conducted during summer months (June 1 through August 31) to minimize potential adverse effects to bats. No vegetation clearing would occur within 0.25-mile of the Simmons-Mingo Cave, a priority 4 bat hibernacula. In addition to clearing of vegetation, increased vehicular and heavy construction equipment along access roads could disturb hibernating bats. These access roads currently experience an average of less than one vehicle trip per day (where a trip is one time up and back; or two passes). During construction, the average daily traffic at the access road near Falling Spring Cave would be approximately 7 vehicle trips per day, and 12 vehicle trips per day on the proposed access road near Simmons-Mingo Cave. This would last for a duration of approximately 8 months (March through October). During operations, access road use would return to baseline levels. In both cases, the hibernacula are located upgradient of the access roads.

The FWS has expressed concern regarding impacts to potentially connected subsurface karst system located upstream of bat hibernacula that could cause changes to structure, hydrology, and/or hibernacula microclimate that could make bat hibernacula unsuitable, and/or disrupt hibernating bats, leading to mortality. To minimize impacts on potential hibernacula, Atlantic has prepared and would implement a *Karst Mitigation Plan* (see appendix I), which identifies measures for avoiding or minimizing impacts on karst features during construction, which could be used by or are connected to bat hibernacula or shelter. In addition, in section 4.7.1 we recommend ERI and/or air track drilling surveys of karst features identified within the construction workspace that are within 5 miles of known or survey identified bat hibernacula based on the results of the pending 2017 karst and hibernacula surveys. Based on the ERI and/or air track drilling surveys, if data suggest that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula, we are recommending that Atlantic consult with the FERC, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on these species and their habitat.

We also received comments on the draft EIS regarding the proposed crossing of Mingo Run and the potential for impacting with the Simmons-Mingo cave system, a known bat hibernaculum. The Mingo Run Valley has been assessed by remote sensing and review of available data. Karst field surveys did not encounter any surface features between AP-1 MPs 65.0 and 65.7. Dye trace studies have confirmed a westward underground water flow between the Simmons Caves and the cave stream in the Simmons-Mingo cave system. ERI surveys are planned for this area in 2019, prior to construction, to evaluate the depth to bedrock voids and determine if any subsurface fractures are present that could be affected by blasting, resulting in stream diversion. Therefore, to ensure that this stream crossing and cave system are protected we have recommended in section 4.1.2.3 that Atlantic provide the results of the ERI studies along with any project design change proposals to avoid impacts on this crossing and cave system, and bat hibernacula.

Blasting may impact protected bat species if the hibernacula or roost trees are within the action area and being used at the time of activities. Blasting could impact bats by causing rocks to fall or mines to collapse that would injure, kill, or trap hibernating bats, or causing bats to awaken during hibernation, decreasing their fitness by causing them to deplete their limited fat reserves prematurely. The potential for blasting to disturb hibernating bats depends on the horizontal and/or vertical distance of the bats from the blast source; Indiana bats have been found from the cave entrances to up to 614 linear feet from limestone cave openings, or up to 2,300 feet in an abandoned iron ore mine in New York (WVDEP, 2006b). Published literature indicates that ground vibration of approximately 12 inches per second are required to cause rocks to fall in unlined tunnels (FWS, 2005a). Although relatively little research has been done, the available literature suggests that hibernating bats can withstand vibration levels of 0.06 to 0.2 inches per second without adverse effects. Underground measurements at bat roost locations in Hellhole Cave, West Virginia suggested that vibrations where bats roosted were 1.33 to 2.76 times less than surface measurements (WVDEP, 2006b). For each area determined to require blasting, a site-specific blasting plan prepared by the construction contractor would be submitted to Atlantic or DETI for approval. If a blasting plan is developed for an area within 0.5 mile of known Indiana bat hibernacula, Atlantic and DETI would coordinate with the FWS. Blasting is not currently anticipated to occur within 0.5 mile of bat hibernacula during the hibernation period.

Atlantic would burn cleared vegetation and stumps if it is infeasible to haul chips off the right-of-way, except on NFS land where burning is prohibited. Depending on the proximity of the burning to adjacent forested habitat, bats may be injured by heat from fires (e.g., if non-volant bats are present or if adults do not have enough time to arouse from torpor and flush from the roost during cooler temperatures). Bats may be injured if the height of flames and heat from the fire reach roosting height (approximately 30 feet) (Frame, 2010). Depending on weather and airflow conditions, smoke and noxious fumes may enter caves or hibernacula, causing roosting and hibernating bats to arouse and flush, which may increase energy expenditure and possibly reduce fitness (Perry, 2011; Dickinson et al., 2009). Fire near caves or hibernacula may alter the vegetation structure near entrances, possibly impacting the microclimate (i.e., temperature and humidity regimes) of these areas (FWS, 2016a).

Noise and lights associated with nighttime construction activities when bats are foraging (e.g., HDD, facility construction) may affect protected bat species, particularly in areas of limited habitat where bat colonies are already stressed. This disruption may lead to reduced fitness for both adult female bats and their young. Studies have shown that Indiana bats can habituate to transient, low intensity, and ongoing airborne sound and human activities. However, significant changes in baseline noise levels in an area can result in temporary to permanent alteration of bat behavior. At low noise levels or farther distances, bats may initially startle, but then habituate to low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical vibrations from heavy machinery and the crashing of falling trees), many bats would probably be startled to the point of flushing from their daytime roosts and in some cases, may experience increased predation risk. For projects that continue for multiple days with noise levels greater than levels usually experienced by bats, bats roosting within or close to these areas are likely to shift their focal roosting areas further away or may temporarily abandon these roosting areas completely. Overall, it is reasonable to assume that some Indiana bats may be temporarily disturbed by noise and vibration of construction activities within or directly adjacent to previous roosting habitat. Combined with the loss of forest habitat, a shift in roosting behavior away from newly constructed corridors would be anticipated (FWS, 2007b and 2016c; Hendricks et al., 2004).

Atlantic and DETI have developed the following conservation measures that would be implemented to reduce or avoid adverse effects to the Indiana bat:

- No tree clearing would be conducted within 150 feet of active maternity roost trees at any time, if maternity roosts are identified in 2017 surveys. Trees would be marked to preserve the microclimate around the maternity roost tree.

- During construction, burning activities would not occur within 500 feet of occupied maternity roost trees from April 1 through November 15 or within 500 feet of occupied hibernacula (if identified during 2017 surveys) and would follow the procedures identified in the *Fire Plan* and the *Open Burning Plan* (see table 2.3.1-1), which includes coordination with state forests.

- To minimize potential impacts on emerging and returning Indiana bats during construction, Atlantic and DETI would limit specific construction activities (clearing, trenching, welding, backfilling, and grading) within 300 feet of active Indiana bat roost trees, if identified during 2017 surveys, from 30 minutes after dawn to 30 minutes before dusk during the summer roosting season as described in table 4.7.1-6. This timing restriction will allow ample time for bats to return to roost trees at dawn and time for bats to emerge from roosts at dusk.

- Atlantic and DETI would work with the FWS to identify conservation easements or sites where known hibernacula occur or where forested areas could be restored to provide replacement bat habitat in the counties crossed or adjacent to ACP and SHP.

- Atlantic would mitigate for the loss of Indiana bat potential primary and secondary roost trees lost due to ACP related activities in West Virginia, which will be provided to the FWS West Virginia Field Office prior to issuance of the Biological Opinion.

- Atlantic would acquire a 400-acre conservation site adjacent to the MNF to provide offsite mitigation, opportunities for bat habitat enhancement, and long-term preservation of bat roosting and suitable hibernacula habitat near ACP. Activities planned include creation of watering/foraging pools, installation of artificial roost structures (e.g., rocket boxes and BrandenBark), and creation of snags.

- DETI would compensate for the loss of potential roost trees on SHP through installation and monitoring of onsite bat boxes. Coordination with the FWS West Virginia Field Office is ongoing.

To minimize impacts on drinking water and bat prey species, ATWS would be located in upland areas at a minimum of 50 feet from wetlands and waterbodies, except where the adjacent areas consist of cultivated or rotated cropland or other disturbed land in accordance with the FERC *Procedures* (see table 2.3.1-1). The sediment and erosion control measures described in section 4.6.4 would be implemented to reduce potential for turbidity and sedimentation. Water would only be discharged to well vegetated upland areas, and equipment refueling and lubricating would occur in upland areas 100 feet or more from the edge of the waterbody and adjacent wetlands per the FERC *Procedures*, or 300 feet from the edge of karst features and sensitive waterbodies (see appendix K). As described in the *SPCC Plan* (see table 2.3.1-1), secondary containment structures (e.g., temporary liners and seamless impermeable berms) would be constructed around aboveground, single wall, storage containers to contain and collect liquids in specified areas isolated from waterbodies in the event of a leak or spill. Additional conservation measures described in section 4.7.1 designed to protect ESA sensitive waterbodies and species may also benefit this species.

As described in Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F), Atlantic would restore riparian areas with native species across the entire width of the construction corridor. Forested riparian areas would be restored and enhanced using plantings of native tree and shrubs, excluding the permanent easement. Restoration of riparian areas would be designed to restore stream bank integrity, withstand periods of high flow, and would include temporary erosion control fencing until restoration is complete. Prior to clearing activities and construction, environmental training for the company and all contractor supervisory personnel would occur to make personnel aware of protective measures for listed species. Atlantic's and DETI's EIs would monitor the construction and restoration phases of the project for compliance with all permit conditions and conservation measures for the projects.

Based on the amount of tree clearing in occupied habitat, and potential impacts on bat hibernacula, ACP and SHP *may affect* the Indiana bat and are *likely to adversely affect* the Indiana bat. Given that the Indiana bat designated critical habitat is located 33 miles from the project area, ACP and SHP would have *no effect* on Indiana bat critical habitat.

National Forest System Lands

No Indiana bats were detected or captured during 2015 and 2016 acoustic and mist-net surveys conducted on the MNF. There are six mist-net sites that remain to be surveyed in 2017. Pedestrian hibernacula surveys on the MNF are complete and no suitable hibernacula were identified. Atlantic has identified 2,718 potential roost trees to date on the MNF survey corridor; 1,207 within the proposed workspace (54 primary and 1,153 secondary roost trees). In addition to the 54 primary roost trees identified by Atlantic in the MNF workspace, 98 live shagbark hickory, which would be considered important potential roost trees according to the MNF Forest Plan standards and guidelines, would also be removed as part of construction.

Acoustic presence/absence surveys in the GWNF identified two sites with possible presence of Indiana bats in 2015; however, follow-up mist-net surveys at these sites did not capture any ESA-listed bat species. Hibernacula surveys were conducted within the survey corridor in 2016 and 2017; no cave or portal opening likely to support bats were found on the GWNF. There are eight acoustic sites on the GWNF that remain to be surveyed in 2017.

The direct and indirect effects of ACP on Indiana bats as described above also apply on NFS lands. Cumulative effects of ACP are discussed in section 4.13. As discussed in Atlantic's *COM Plan* (see appendix G), Atlantic would comply with the tree clearing restrictions identified in table 4.7.1-6. Atlantic is consulting with the MNF and GWNF regarding revegetation and seeding requirements for permanent easements and temporary construction rights-of-way on federally managed lands, which will be provided in the final *COM Plan* (appendix G) prior to construction. In addition to the conservation measures described above, Atlantic has committed to the following conservation measures on NFS lands that would further reduce adverse impacts on this species:

- Atlantic would replant all ATWS and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, with a combination of indigenous tree and shrub seedlings on NFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the FS;

- the right-of-way edges would be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public;

- Atlantic would employ the least-intrusive tree removal methods to reduce damage to the adjacent forest; and

- ATWS would be set back at least 100 feet from in-stream waterbody crossings that occur on NFS lands to meet the requirements of the Forest Plans for both the MNF and GWNF.

4.7.1.4 Northern Long-eared Bat

The federally threatened northern long-eared bat is a medium-sized species in the Vespertilionidae family, characterized by long ears that extend beyond the nose when laid forward (FWS, 2016d). On April 1, 2015, the FWS listed the northern long-eared bat as threatened under the ESA and simultaneously published an interim 4(d) rule; the final listing and interim 4(d) rule took effect as of May 4, 2015 (FWS, 2015d). However, in order to be eligible under the 4(d) rule consultation framework, the following actions must be avoided: 1) disturbance of hibernating northern long-eared bat in known hibernacula; 2) alteration of the entrance or interior environment of a known hibernacula; 3) tree clearing within 0.25 mile of known bat hibernacula at any time of year; and 4) cutting or destroying known occupied maternity roost trees, or other trees within 150-foot radius of the maternity roost tree from June 1 through July 31. As further discussed below, Atlantic and DETI are currently proposing tree clearing within 0.25 mile of bat hibernacula, and have the potential to alter the entrance or interior environment of known hibernacula; therefore, the streamlined consultation framework will not be applied to ACP or SHP. Rather, standard section 7 consultation for northern long-eared bat will apply.

This species predominantly over-winters in hibernacula that include caves and abandoned mines; however, in West Virginia, the species is rarely found in traditional hibernacula (caves and mines) and more research is needed to determine where the bulk of the population is over-wintering on the landscape. Like many other hibernating bat species, northern long-eared bat populations in the northeast have been decimated by WNS. The FWS indicated that WNS was the predominant reason for federal listing of the species in 2015 (FWS, 2015d), and populations have declined by up to 99 percent at many hibernation sites in the northeast. Bats begin swarming activities (i.e., mating and feeding) near hibernacula in August or September and enter hibernation by October or November. In March or April, the species emerges from hibernation, and will feed near the hibernacula, returning to the caves during the day. During summer, northern long-eared bats roost singly or in colonies under bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places such as caves and mines. This species is thought to be a habitat generalist, and is opportunistic in selecting roosts, utilizing tree species based on the tree's ability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures such as barns and sheds (FWS, 2016d). For more information on the northern long-eared bat's natural history, distribution, and threats, refer to the Final Rule listing the species as threatened published by the FWS on April 2, 2015 (FWS, 2015d).

The northern long-eared bat has the potential to occur in all counties crossed by ACP and SHP in West Virginia, Virginia, North Carolina, and Pennsylvania. Species occurrence is based on a desktop review using the FWS IPaC website and on consultations with the FWS. The FWS West Virginia Field Office confirmed known occurrences of the species in Harrison, Lewis, Pocahontas, and Randolph Counties (FWS, 2014a). West Virginia NHI data identified six occurrences of northern long-eared bat within 5 miles of ACP, and data from the MNF long-term mist-netting efforts identified over 400 northern long-eared bat occurrences within 5 miles of ACP. The Virginia WERMS data identified occurrences in Bath, Highland, Buckingham, and Augusta Counties and the City of Chesapeake.

Atlantic and DETI developed study plans for listed bat species in coordination with the FWS field offices in Pennsylvania, West Virginia, Virginia, and North Carolina, and the GWNF and MNF. Table 4.7.1-8 lists the number and locations of the northern long-eared bat that were detected during Atlantic's surveys in 2015 and 2016, by state and county. Atlantic conducted acoustic and mist-net surveys along the ACP route in 2015 and 2016. Northern long-eared bats were detected at a total of 9 sites in West Virginia, 23 sites in Virginia, and 30 sites in North Carolina, and there were two captures at two sites within the ACP survey area. There were 38 captures of the northern long-eared bat at 21 sites within the SHP survey area. Surveys of 113 acoustic sites and 11 mist net sites remain to be completed.

TABLE 4.7.1-8

2015 and 2016 Summary of Northern Long-Eared Bat Survey Results (Sites with Occurrences) for the Atlantic Coast Pipeline and Supply Header Project

Project/State	County	Number of Positive Acoustic Occurrences [a]	Mist Net Captures
ATLANTIC COAST PIPELINE			
West Virginia	Lewis	2	0
	Upshur	1	0
	Randolph	1	0
	Pocahontas	5	1
Virginia	Highland	1	0
	Augusta	3	0
	Nelson	1	1
	Buckingham	2	0
	Dinwiddie	2	0
	Brunswick	2	0
	Southampton	5	0
	Suffolk	7	0
North Carolina	Northampton	6	0
	Halifax	7	0
	Nash	11	0
	Wilson	2	0
	Johnston	1	0
	Cumberland	1	0
	Robeson	2	0
SUPPLY HEADER PROJECT			
West Virginia	Wetzel	7	9
	Doddridge	14	29
Total Occurrences		**83**	**40**

[a] Acoustic occurrences include acoustic detections that reverted to probable absence due to negative mist net survey results.

Winter acoustic surveys were also conducted in North Carolina to determine bat activity outside of the summer period. Of the 25 acoustic sites, potential northern long-eared bats were detected at 11 sites as early as March 5, 2016; however, only 7 sites detected potential northern long-eared bat calls for more than one night of survey. It is possible that the acoustic surveys detected southeastern bats or little brown bat calls that were attributed to northern long-eared bat. Bat activity appeared to correlate with temperature, with more than two-thirds of positive site nights having a minimum temperature of 50 °F; southeastern bats may be more active at the end of the winter season.

Data were reviewed from the WVDNR and the West Virginia and Virginia Speleological Societies, in addition to 2016 surveys, to identify known bat hibernacula within 5 miles of ACP (see table 4.7.1-9). There are six known northern long-eared bat hibernacula in West Virginia and seven in Virginia, of which one (Falling Spring Cave) is within 0.25 mile of the ACP workspace. Based on the FWS Final Environmental Assessment for the 4(d) Rule for the Northern Long-Eared Bat, there are 104 known bat hibernacula in West Virginia, but only 11 currently known in Virginia (FWS, 2015e).

TABLE 4.7.1-9

Known Northern Long-Eared Bat Hibernacula within 5 Miles of the Atlantic Coast Pipeline [a]

County, State	Hibernaculum Name	Approximate Distance to Workspace (miles) [b]	Priority Number [c]	Max Population Estimate 2000-2007
Randolph, WV	Fortlick Cave	2.5 (CY)	3	109
Randolph, WV	Stewart Run Cave	4.9 (CY)	3	40
Pocahontas, WV	Dreen Cave	0.7 (AR)	4	0
Randolph, WV	Falling Spring Cave	<0.1 (AR)	4	49
Pocahontas, WV	Justrite Cave	0.8 (AR)	NA	NA
Randolph, WV	Left Tit Pit	0.7 (AR)	NA	NA
Bath, VA	Starr Chapel Saltpeter Cave	2.0 (AR)	3	67
Bath, VA	Adjacent to Hidden Valley Waterhole	2.0 (AR)	NA	NA
Bath, VA	Mountain Grove Saltpeter Cave	3.4 (CY)	4	2
Bath, VA	Breathing Cave [d]	2.3 (AR)	NA	NA
Bath, VA	Clarks' Cave [d]	3.1 (AR)	NA	NA
Bath, VA	Witheros Cave [d]	4.7	NA	NA
Augusta, VA	Adjacent to Elkhorn Mountain	2.7	NA	NA

a There are no known northern long-eared bat hibernacula within 5 miles of SHP.

b CY – Contractor Yard, AR – Access Road.

c Priority 1 is highest priority, and most essential to recovery of the species. Priority 4 is least important to recovery (FWS, 2007a).

d Sites found in the Virginia WERMS, but not present in NHI or tabular data provided by the state and the FWS Virginia Field Office; these records may include incidental reports by cavers.

Atlantic identified potential bat hibernacula based on features identified through desktop review, roadside and pedestrian surveys, and 2016 karst surveys. Harp trapping and/or acoustic surveys were conducted at all sites identified by Phase 1 surveys as potentially suitable hibernacula during the fall emergence survey window. As described in table 4.7.1-3, surveys identified 21 potential hibernacula within 1 mile of ACP construction workspace; northern long-eared bats were captured at one site, PS-S014/ Simmons-Mingo Cave, and were detected at three other sites: PH-S018, PH-S007/PH-S008, and PH-S019. Eight sites were surveyed during the fall swarming season and were found to not be occupied. Four additional sites were identified as potentially suitable, and were surveyed during the spring emergence or will be surveyed during fall swarming period in 2017. No portals or caves were identified as suitable habitat for northern long-eared bat along SHP. Occupancy surveys are planned in fall 2017 for the 23 remaining suitable hibernacula. Additionally, a total of 210.1 acres of pedestrian hibernacula surveys, and 49 potential hibernacula location (Phase 1) surveys remain to be completed.

A total of 22 occupied roost trees were identified in West Virginia on SHP; eight of which fall within 150 feet of the SHP workspace and would be cleared outside of the pup season. In Virginia, a total of six occupied roost trees were identified, none of which were within 150 feet of the ACP workspace. Potential roost tree surveys for northern long-eared bats were conducted concurrently with those conducted for Indiana bats. Surveys identified 251 primary roost trees and 2,033 secondary roost trees within the ACP workspace, and 78 primary roost trees and 562 secondary roost trees within the SHP workspace in West Virginia. Primary roost trees are more likely to support a maternity colony than secondary roost trees. A total of 92.4 acres of potential tree surveys remain to be completed.

Atlantic and DETI would clear occupied northern long-eared bat forested habitat during the winter season, as defined in table 4.7.1-6, when northern long-eared bats are hibernating and not present on the landscape. Occupied northern long-eared bat habitat is defined as:

- 3-mile radius of a positive acoustic detection or mist net capture location; and
- 1.5 miles from documented maternity roost trees.

Total acreage of potential northern long-eared bat occupied and suitable habitat that would be affected by construction is pending completion of 2017 surveys. Therefore, **we recommend that:**

- **<u>Prior to construction and upon completion of 2017 surveys</u>, Atlantic and DETI should file with the Secretary and FWS the total acreages of:**

  a. northern long-eared bat occupied habitat that would be impacted by ACP and SHP; and

  b. northern long-eared suitable habitat that would be impacted by ACP and SHP.

Because the northern long-eared bat uses similar habitat as the Indiana bat, the impact analysis and conservation measures described in section 4.7.1.3 would also generally apply, including the discussion on potential impacts associated with roost trees, hibernacula, blasting, burning of cleared vegetation and stumps, noise emissions and vibrations, and lights. The impact analysis and conservation measures that are unique or differ from the Indiana bat are described below.

To avoid direct impacts on northern long-eared bats, Atlantic and DETI would conduct site preparation and clearing activities between November 16 and March 31, which avoids the summer roosting, fall swarming, and spring emergence periods. No direct impacts on summer roosting, swarming, or emerging bats using trees for roosts are anticipated from tree clearing activities.

ACP and SHP would affect eight active roost trees located within a 150-foot buffer of the SHP workspace that would be cleared. Where northern long-eared bat maternity roost trees have been identified, and in areas already affected by WNS, no tree clearing would be conducted during the pup season (June 1 through July 31) within 150 feet of identified active maternity roost trees; thus, no direct impacts on the species is anticipated. However, similar to the Indiana bat, tree clearing within the occupied habitat area would still cause loss of known and unknown maternity roost trees, and could stress individual bats during pregnancy. In contrast to the Indiana bat, the northern long-eared bats use a wider variety of roost tree types, and although they exhibit fidelity to summer range, fidelity to individual roosts may be less (FWS, 2014b). One study suggests that northern long-eared bat population numbers would be robust in response to low levels of roost loss in areas where forested habitat is not limited (Silvis et al., 2015). If 2017 surveys identify additional active roost trees within 150 feet of access roads or construction workspace, trees in this buffer would not be removed during the pup season (June 1 through July 31).

In general, the northern long-eared bat is not habitat limited and is considered a habitat generalist (i.e., able to use a variety of habitats). Development that has been on-going in the range of the northern long-eared bat has not had an overall negative effect on populations (FWS, 2016e). Therefore, loss of suitable habitat due to tree clearing for ACP or SHP is not expected to have a significant effect on northern long-eared bats on the landscape. Suitable habitat occurs adjacent to the pipeline right-of-way and associated facilities, which bats can use as an alternative while construction occurs.

Fragmentation of forested habitat used for foraging or migration by the northern long-eared bat may impact the protected bat species. The northern long-eared bat is a forest-interior species adapted to cluttered forest environments, and the species roosts and forages in closed, intact forest stands (Lausen, 2009). Northern long-eared bats have also been known to forage along forest edges, paths, riparian areas, and ponds and streams (WIDNR, 2013; Henderson and Broders, 2008). A reduction in the amount of forested habitat available in the general vicinity of roost trees or foraging areas could alter use patterns in an area or preclude use of an area altogether. Even marginally suitable fragmented forest can become important habitat to listed bat species as undisturbed or less fragmented forests become less available (Medlin et al., 2010; Gorresen and Willig, 2004). Forest structure and fragmentation study conducted in Missouri Ozark forests found that in areas dominated by forest cover, nonforest areas may provide landscape heterogeneity fulfilling some habitat requirement not provided in a fully forested landscape for northern long-eared bats (Yates and Muzika, 2006).

Atlantic would burn cleared vegetation and stumps if it is infeasible to haul chips off the right of way, except on NFS land where burning is prohibited. Depending on the proximity of the burning to adjacent forested habitat, bats may be injured by heat from fires (e.g., if non-volant bats are present or if adults do not have enough time to arouse from torpor and flush from the roost during cooler temperatures). Bats may be injured if the height of flames and heat from the fire reach roosting height (approximately 30 feet) (Frame, 2010). Depending on weather and airflow conditions, smoke and noxious fumes may enter caves or hibernacula, causing roosting and hibernating bats to arouse and flush, which may increase energy expenditure and possibly reduce fitness (Perry, 2011; Dickinson et al., 2009). Fire near caves or hibernacula may alter the vegetation structure near entrances, possibly impacting the microclimate (i.e., temperature and humidity regimes) of these areas (FWS, 2016a).

Although tree clearing would not take place during the fall swarming or spring emergence periods, the removal of forested habitat surrounding hibernacula could affect fall swarming and spring emergence activities by decreasing the availability of important food sources. If these sources are not available during the periods when bats are most vulnerable (i.e., during critical calorie-intake periods to either prepare for or recover from hibernation), the fitness of individual bats entering or leaving the hibernacula may be reduced (FWS, 2012a). Construction activities occurring within 3 miles of the 13 known northern long-eared bat hibernacula (see table 4.7.1-9) could also cause individuals to avoid these hibernacula, which could also reduce species fitness by interrupting breeding during fall swarming. There are five known and survey-identified hibernacula within 0.5 mile of the ACP workspace (tables 4.7.1-9 and 4.7.1-3, respectively). Atlantic has proposed the following activities at these locations:

- Falling Spring Cave (less than 0.1 mile from ACP access road): no tree clearing within 0.25 mile; however, some tree trimming may be required which is not anticipated to adversely impact northern long-eared bats. Falling Spring Cave is located upgradient of the proposed access road.

- Simmons-Mingo Cave/PH-S014: no tree clearing would occur within 0.25 mile of the hibernaculum. Simmons-Mingo Cave/PH-S014 is located upgradient of the proposed access road.

- PH-S018 (within 0.5 mile of two proposed access roads): tree clearing of 0.4 acre of trees within the 0.25-mile buffer to widen the road to allow construction vehicle operation. PH-S018 is located downgradient of both proposed access roads.

- PH-S007/PH-S008 (0.2 mile from ACP access road): no tree clearing within 0.25 mile; however, some tree trimming may be required which is not anticipated to adversely impact northern long-eared bats. PH-S007/PH-S008 is located upgradient of the proposed access road.

In addition to clearing of vegetation, increased vehicular and heavy construction equipment along access roads could disturb hibernating bats. These access roads currently experience an average of less than one vehicle trip per day (where one trip is up and back; or two passes). During construction, the average daily traffic at these access roads would range from approximately 7 to 12 vehicle trips per day and would last for a duration of approximately 8 months (March through October). During operations, access road use would return to baseline levels.

A total of 210.1 acres of pedestrian hibernacula surveys and 49 potential hibernacula locations (Phase 1) surveys remain to be completed. If a new hibernaculum is identified during surveys, the route will be adjusted to avoid direct impacts on the hibernaculum. The FWS has expressed concern regarding impacts to potentially connected subsurface karst system located upstream of bat hibernacula that could cause changes to structure, hydrology, and/or hibernacula microclimate that could make bat hibernacula unsuitable, and/or disrupt hibernating bats, leading to mortality. To minimize impacts on potential hibernacula, Atlantic has prepared and would implement a *Karst Mitigation Plan* (see appendix I), which identifies measures for avoiding or minimizing impacts on karst features during construction, which could be used by or are connected to bat hibernacula or shelter. In addition, in section 4.7.1 we recommend ERI and/or air track drilling surveys of karst features identified within the construction workspace that are located within 5 miles of known or survey identified bat hibernacula based on the results of the pending 2017 karst and hibernacula surveys. Based on the ERI and/or air track drilling surveys, if data suggest that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula, we recommend that Atlantic consult with the FERC, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on bat species and their habitat.

Atlantic and DETI have developed the following additional conservation measures that would be implemented to reduce or avoid adverse effects to the northern long-eared bat:

- to minimize potential impacts on foraging northern long-eared bats during construction, Atlantic and DETI would limit specific construction activities (clearing, trenching, welding, backfilling, and grading) within 150 feet of active northern long-eared bat roost trees from 30 minutes after dawn to 30 minutes before dusk during the summer roosting season as described in table 4.7.1-6. This timing restriction would allow ample time for bats to return to roost trees at dawn and time for bats to emerge from roosts at dusk;

- within 150 feet of known occupied maternity roost trees (i.e., the eight roosts located within SHP workspace), clearing would occur outside of the pup season (June 1 through July 31); and

- during construction, burning activities would not occur within 500 feet of occupied maternity roost trees from April 1 through November 15 or within 500 feet of occupied hibernacula (if identified during 2017 surveys), and would follow the procedures identified in the *Fire Plan* and *Open Burning Plan* (see table 2.3.1-1), which includes coordination with state forests.

We have determined that there is potential for take of this species for the following reasons:

- construction of ACP could disturb hibernating northern long-eared bats in known hibernacula located within 3 miles of a workspace;

- ACP construction activities could alter the entrance or interior environment of known hibernacula through indirect impacts on the connected subsurface karst system; and

- Atlantic proposes to remove trees within 0.25 mile of a known hibernaculum.

Based on currently available data, ACP and SHP *may affect* the northern long-eared bat, and are *likely to adversely affect* northern long-eared bat. FERC and FWS will re-evaluate this determination upon receipt of pending survey results and proposed conservation measures.

National Forest System Lands

In 2015, five northern long-eared bats were captured at four mist-net sites on the MNF; no northern long-eared bats were captured in 2016, and surveys are pending at six sites in 2017. Pedestrian hibernacula surveys on the MNF are complete and no suitable hibernacula were identified. Atlantic has identified 2,718 potential roost trees to date on the MNF; 1,207 potential roost trees fall within the construction workspace within the MNF (54 primary roost trees, and 1,153 secondary roost trees). A total of 98 live shagbark hickory would also be removed as part of construction; these would be considered important potential roost trees according to the MNF Forest Plan standards and guidelines.

Acoustic surveys conducted in 2015 in the GWNF detected northern long-eared bats at three sites; however, follow-up mist-netting at these locations did not result in any captures of the species. Pedestrian hibernacula surveys were conducted within the survey corridor in 2016; no cave or portal opening likely to support bats were found on the GWNF. There are eight acoustic sites on the GWNF that remain to be surveyed in 2017.

The direct and indirect effects of ACP on northern long-eared bats as described above also apply on NFS lands. As discussed in Atlantic's *COM Plan* (see appendix G) that would apply to the MNF and GWNF, Atlantic would comply with the tree clearing restrictions identified in table 4.7.1-6. Atlantic is consulting with the MNF and GWNF regarding revegetation and seeding requirements for permanent easements and temporary construction rights-of-way on federally managed lands, which will be provided in the final *COM Plan* prior to construction. In addition to the conservation measures described above, Atlantic has committed to the following conservation measures on NFS lands that would further reduce adverse impacts to this species:

- Atlantic would replant all ATWS and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, with a combination of indigenous tree and shrub seedlings on NFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the FS.

- The right-of-way edges would be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Atlantic would employ the least-intrusive tree removal methods to reduce damage to the adjacent forest. ATWS would be set back at least 100 feet from in-stream waterbody crossings that occur on NFS lands to meet the requirements of the Forest Plans for both the MNF and GWNF.

In addition to the requirements and conservation measures associated with FWS consultations, FS Forest Plan Standards and Guidelines apply. The MNF Forest Plan Standard TE07 states that SUPs may be authorized in threatened, endangered, or proposed species habitat if the uses do not adversely affect populations or habitat. Because of the large number of potential roost trees that would be impacted within the MNF, the majority in an area that has been known to support many reproductively active northern long-eared bats (based on previous MNF mist-netting results), the removal of these trees and snags will result in adverse effects to both habitat and the local northern long-eared bat population. At a minimum, mitigation for this loss of habitat should include a combination of tree-snagging and installation of bat box (rocket box) clusters along the edge of disturbance (within the temporary workspace) following construction. These efforts should include suitable replacement habitat for the loss of potential optimal roost trees (i.e., all shagbark hickory greater than 5 inches DBH and any snags cut within the construction right-of-way), should be focused in those affected areas, and specific locations guided by coordination with the MNF. The installed boxes should be monitored annually for a minimum of 3 years to ensure that they are installed appropriately and assess their efficacy in providing roosting habitat in the impacted area. Atlantic continues to consult with the FWS and FS to finalize the conservation measures for this species.

4.7.1.5 Red-cockaded Woodpecker

The red-cockaded woodpecker was listed as endangered in 1970. It is a small, insectivorous bird approximately 7 inches (18 centimeters) long, and is characterized by black and white barring on the back and a large white cheek patch bounded by a black cap and malar stripe. The male has a small red patch on the cheeks visible only when agitated (Cornell Lab of Ornithology [CLO], 2016a; FWS, 2016f). Critical habitat has not been designated for this species. For more information about the red-cockaded woodpecker's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2006 (FWS, 2006a).

The FWS IPaC system identified the potential for this species to occur in Southampton County and City of Suffolk, Virginia and in Northampton, Halifax, Nash, Wilson, Johnston, Sampson, Cumberland, Robeson, Harnett, and Scotland Counties, North Carolina. The FWS Virginia Field Office indicated the species is most likely to occur in the Piney Grove Preserve in Sussex County, Virginia approximately 23 miles north of ACP AP-3 mainline; and potential habitat can be found in Southampton County, Virginia. Natural Heritage Program data in North Carolina and Virginia identified one occurrence of the red-cockaded woodpecker within 2 miles of the ACP centerline and access road in City of Suffolk, Virginia and seven occurrences within 2 miles of the centerline and access road in Johnston and Robeson Counties, North Carolina.

The red-cockaded woodpecker is a habitat specialist, preferring longleaf pine (*Pinus palustris*) stands, but will utilize other pine species within mature forests. The species lives in family units known as groups which cooperate to raise young. The territory for a group averages approximately 125 to 200 acres in size (CLO, 2016a; FWS, 2016f).

Potentially suitable foraging habitat for the species was identified during desktop reviews and environmental surveys along the proposed routes in 2014. Atlantic developed a study plan for aerial surveys for nesting cavity trees within 0.5 mile of suitable habitat and 0.5 mile of NHI occurrences in suitable habitat. These study plans were developed in consultation with the NCWRC and the FWS Virginia and North Carolina Field Offices.

Atlantic completed aerial surveys in 2015 and 2016 prior to leaf out, and did not identify any active cavity trees within the 300-foot-wide study corridor or within the target survey areas. One tree with possible cavity starts was identified during aerial surveys in Cumberland County, North Carolina; a follow-up field visit to the site documented the cavity starts as not active. This tree is now located 1.5 miles from the proposed ACP route. Reroutes identified after the close of 2015 surveys were determined to contain potentially suitable habitat for the species. Surveys were conducted in these areas and others where desktop review identified suitable habitat in 2016. The aerial surveys identified one pine tree that appeared to have an abundance of sap drips, but no evidence of a cavity, cavity plate, or cavity start in Cumberland County, North Carolina. Follow-up field surveys confirmed that the tree was not an active red-cockaded woodpecker cavity tree.

Temporary removal of forest cover along the pipeline route could lead to a loss of 111.1 acres of potentially suitable red-cockaded woodpecker foraging habitat. In addition, loss of forest cover in the permanently maintained right-of-way may cause fragmentation of potentially suitable habitat making it unavailable for future use by red-cockaded woodpeckers. As discussed in section 4.5.6, forested habitat along the ACP route in North Carolina has already been fragmented and isolated; therefore, additional impacts from construction of ACP on these fragmented landscapes contribute to further degradation of available wildlife habitat. In addition, both the FWS and NCWRC have recommended replanting of long-leaf pine to mitigate impacts on the red-cockaded woodpecker. Therefore, **we recommend that:**

- **<u>Following construction</u>, Atlantic should replant long-leaf pine within the ATWS and the temporary construction workspace along the ACP route, and outside the 50-foot-wide permanent right-of-way, where it was cleared for construction. Based on Atlantic's May 1, 2017 supplemental filing, long-leaf pine-wire grass communities occur between AP-2 MPs 156.5 and 156.9.**

No red-cockaded woodpecker cavity trees were identified along the proposed ACP route. Clearing for construction would cause long-term loss of suitable habitat until the trees regrow adjacent to the pipeline right-of-way. Because no cavity trees were identified within 0.5 mile of ACP workspace, noise is not expected to affect nesting red-cockaded woodpeckers. However, noise from construction and operations activities could temporarily cause foraging red-cockaded woodpeckers to avoid the area. There is plentiful suitable foraging habitat near ACP; therefore, noise-associated impacts are not expected to be significant. Further, our recommendation for replacement of long-leaf pine in red-cockaded woodpecker foraging habitat would mitigate long-term impacts on this habitat. Therefore, we have determined that ACP *may affect* the red-cockaded woodpecker; however, ACP is *not likely to adversely affect* the red-cockaded woodpecker.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.6 Cheat Mountain Salamander

The federally threatened Cheat Mountain salamander is a small woodland salamander approximately 4 inches in length; the tail is approximately the same length of the body. The dorsal coloring is dark brown or black with dark silver or bronze flecks, while the ventral surface is uniformly gray. The species is characterized by 17 to 19 costal grooves running vertically along the length of the body (FWS, 1989; WVDNR, 2005).

The species is found in the Allegheny Mountains in eastern West Virginia generally above 2,980 feet in forested areas, although appropriate habitat at elevations above 2,000 feet in the extreme northern limit of the range could be considered as potential habitat for Cheat Mountain salamander (FWS, 2009c). Cool, moist forests made up of red spruce (*Picea rubens*) and yellow birch (*Betula alieghaniensis*) and emergent rocks are preferred (FWS, 1989). The species is nocturnal, and hides in leaf litter, snags, under logs and rocks during the daylight hours, coming out at night to forage for small insects and other invertebrates such as mites, beetles, flies, and ants (FWS, 2009c). For more information on the Cheat Mountain salamander's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2009 (FWS, 2009c).

The species overwinters underground, and emerges in early spring; timing of submergence and emergence is temperature- and moisture-dependent and varies from year to year. Breeding typically occurs in late April, May, and early June. Nests are found in protected areas under rocks, logs, or bark and are shallow depressions in the soil. Females lay 5 to 11 eggs and attends the nest until young emerge fully developed approximately 4 months later (FWS, 2009c).

Found only in West Virginia, the species occurs in Randolph and Pocahontas Counties within and adjacent to the boundaries of the MNF. Species occurrence is based on a desktop review using the FWS IPaC website and on consultations with the FWS. The nearest known occurrence of Cheat Mountain salamander provided by the FWS is approximately 2.3 miles from the proposed ACP mainline. While the former extent of its range is unknown, the current patchy distribution and restriction of the species to high-elevation spruce-dominated forests is likely the result of intense logging practices and the subsequent burning of the landscape in the early 20th century (WVDNR, 2005).

Atlantic developed survey plans for the Cheat Mountain salamander in consultation with the FWS and MNF. Surveys in 2015 identified 37 areas of potentially suitable habitat along the proposed ACP route in West Virginia. Presence/absence surveys captured two Cheat Mountain salamanders in the MNF. Atlantic incorporated an alternative route to avoid modeled habitat for the species and conducted habitat surveys within the MNF along the new route near Gibson Knob and Cloverlick Mountain in 2016. Suitable habitat was not found in these areas.

ACP is expected to have *no effect* on the Cheat Mountain salamander. Atlantic revised the ACP route such that suitable and known occupied Cheat Mountain salamander habitat is avoided. By rerouting the pipeline to a location with no occupied or suitable habitat, no additional conservation measures are necessary.

National Forest System Lands

As discussed above, this species is found on NFS lands in Pocahontas and Randolph Counties within and adjacent to the boundaries of the MNF. Cheat Mountain salamander surveys conducted along a previous alignment captured two individuals within the MNF in 2015. Atlantic incorporated an alternative route to avoid modeled habitat for the species and conducted habitat surveys within the MNF along the new route near Gibson Knob and Cloverlick Mountain in 2016. Suitable habitat was not found in these areas. By rerouting the pipeline to a location with no occupied or suitable habitat, no additional conservation measures would be necessary.

4.7.1.7 Neuse River Waterdog

The Neuse River waterdog is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and listing may be warranted. A status review was initiated in September 2011; the listing decision and 12-month finding is expected on or before September 30, 2017. If listing of the species is warranted, a final rule on the listing status will be made within 12 months. The FWS recommended addressing the Neuse River waterdog in this EIS because the species may be proposed for listing and/or listed during the life of the project.

The Neuse River waterdog is a small freshwater amphibian endemic to North Carolina. Characterized by large feathery gills and a rusty-brown body mottled by dark spots across the back, the species can be found in moderate- to swift-flowing, clear streams with sand and gravel bottoms (Lai, 2011). The Neuse River waterdog requires waters with relatively high oxygen levels and water quality. In late fall and winter, the species utilizes large accumulations of submerged leaves in the eddies and backwaters of summer streams, and will often use burrows and spaces under rocks. Eggs are attached to the underside of objects in low silt moderate-flow areas of streams (Braswell, 2004). The FWS has not published a recovery plan or conducted a 5-year status review for the Neuse River waterdog.

The Neuse River waterdog is found within the ACP project area in the Neuse and Tar-Pamlico drainage basins in Halifax, Nash, Wilson, and Johnston Counties, North Carolina. The Neuse River waterdog is not found in the SHP project area. Species occurrence is based on consultations with the FWS. The FWS identified known potential habitat occurrences of the Neuse River waterdog within, but not limited to, the Tar River mainstem, Fishing Creek, Swift Creek, Buffalo Creek, Little River, and Contentnea Creek (FWS, 2015f). North Carolina NHI data listed occurrences in Fishing Creek within 2 miles of the mainstem in Nash, Halifax, and Johnston Counties.

Atlantic evaluated perennial streams in the Tar and Neuse River basins in 2015, 2016, and 2017. Presence/absence surveys were conducted in areas identified as containing suitable habitat for the species. Desktop analysis and field surveys identified 29 perennial streams as having suitable habitat and 28 were surveyed for Neuse River waterdog in 2016. The Millstone Creek, Jacket Swamp, and Beaverdam Swamp crossings were not fully surveyed due to a lack of landowner permissions. These remaining waterbodies would be surveyed prior to construction.

Suitable habitat was identified at 19 waterbody crossing locations; presence was confirmed at 4 waterbody crossing locations. A total of 42 Neuse River waterdogs were captured at these sites. Atlantic has committed to completing surveys at the remaining waterbodies with potentially suitable habitat for the Neuse River waterdog prior to construction, and would submit survey results to the FERC and FWS.

Atlantic has committed to using the HDD method to cross the four waterbodies with known presence of Neuse River waterdogs, and at one additional waterbody where presence has been assumed (Contentnea Creek) to minimize direct impacts on the species if present during construction. However, some individuals may be affected if there is an inadvertent return of drilling fluid used in the crossing. The drilling fluid, which consists primarily of water mixed with bentonite clay (and additives such as thickening agents), could affect water quality at the point of the release in or near the waterbody, which in turn could impact Neuse River waterdogs at or in the nearby downstream area.

Twelve waterbodies with suitable habitat for the Neuse River waterdog would be crossed using the open-cut method, and two additional waterbodies would be crossed using a dry crossing technique (e.g., dam and pump or cofferdam). In-stream crossing methods in areas with suitable habitat for Neuse River waterdog could cause mortality to individuals, and equipment may damage or crush eggs if present during construction. In-stream construction activities and removal of riparian habitat along waterbodies with suitable habitat for Neuse River waterdogs could temporarily increase sediment suspension and alter bottom substrates. Similarly, construction activities along access roads and within construction workspace adjacent to waterbodies and traffic along access roads and the construction right-of-way could cause sediment to reach the waterbody. Increased turbidity associated with in-stream activities may interfere with Neuse River waterdog foraging by interfering with visibility. Turbidity may increase waterdog susceptibility to predation and interfere with migratory behavior. No blasting or rock removal would be required at these waterbodies.

Water withdrawal is proposed at Tar River and Contentnea Creek to support HDD construction where Neuse River waterdogs are assumed present (see section 4.3.2.7). Intake pumps have the potential for entrainment or impingement of individuals. Water withdrawals have the potential to reduce water flow volumes and velocities in streams, causing an increase in sedimentation, altering dissolved oxygen levels, and affecting water levels in streams altering habitat for the Neuse River waterdog.

The use of the HDD technique would eliminate the need to conduct vegetation clearing at the waterbodies where Neuse River waterdog are known to occur. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. Minor hand clearing of vegetation may occur to lay guidewires for construction or to place pumps for water withdrawal activities. Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies. Atlantic has designed HDDs to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in its *HDD Plan* (see appendix H), which includes measures to contain, clean-up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on Neuse River waterdog, if present.

Atlantic has also committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Wet construction techniques (e.g., trenching, wet open-cut, and culvert replacement) would also undergo aquatic species removal within all areas of direct impact from construction, as well as an appropriate upstream and downstream buffer to account for downstream transport of debris and sediment. The extent of the downstream buffer would be determined in the field and would vary depending on stream width, depth, water velocity, substrate composition, species abundance, and crossing technique. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Removal of waterdogs and other aquatic species at the crossing prior to construction may cause stress, physical injury, or death to some individuals.

In waterbodies where additional surveys are needed, if Neuse River waterdogs are identified, turbidity curtains would be installed downstream of the crossing to reduce turbidity, and in-stream activities would avoid the egg laying and hatching period from April through July. If a waterbody is crossed by an access road, and Neuse River waterdogs are identified, no access road improvements that require in-stream activity would be conducted. In locations with potentially suitable habitat, waterbodies would be restored in accordance with waterbody crossing plans and permits and the FERC *Plan* and *Procedures* (see table 2.3.1-1). As described in Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F), Atlantic would restore riparian areas with native species across the entire width of the construction corridor. Forested riparian areas would be restored and enhanced using plantings of native tree and shrubs, excluding on the permanent easement. Restoration of riparian areas would be designed to restore stream bank integrity, withstand periods of high flow, and would include temporary erosion control fencing until restoration is complete.

The FWS has expressed concern with sediment-laden discharge water that could originate from nearby access roads and could drain into waterbodies occupied by the Neuse River waterdog. No ACP access roads would cross waterbodies where Neuse River waterdog were identified during survey or are assumed to be present. Refer to section 4.6.4 for a more thorough discussion of potential impacts of sedimentation and turbidity resulting from in-stream construction activities, access road use, and runoff from the adjacent construction workspace and access roads on aquatic resources. Similarly, accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach waterbodies with aquatic species, it could harm aquatic species through exposure to chemical contaminants or petroleum products. As described in section 4.6.4, Atlantic would implement the measures in the FERC *Plan* and *Procedures* and Atlantic's and DETI's *SPCC Plan* (see table 2.3.1-1), in addition to the FWS' enhanced conservation measures for ESA sensitive waterbodies described in section 4.7.1, to minimize sedimentation, turbidity, and accidental spills to the extent possible during construction to reduce water quality impacts on the Neuse River waterdog.

The Tar River HDD is planned to begin in March or April 2018 and would take approximately 60 days and use 1.2 million gallons of water. The Contentnea Creek HDD is anticipated to start in March or April 2019 and is also expected to take approximately 60 days and use 1.1 million gallons of water. Atlantic would minimize impacts resulting from water withdrawal on Neuse River waterdog at the Tar River by using 1 mm or smaller screens to minimize impingement/entrainment, limiting water withdrawal to not exceed 10 percent of instantaneous flow, ensuring that intake velocity does not exceed 0.25 f/s, and using floating intake structures to avoid impacts on stream bed.

An ESA determination is not applicable for the Neuse River waterdog because the species is not yet listed or proposed under the ESA. Implementation of the conservation measures identified above would minimize potential impacts to this species.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.8 Atlantic Sturgeon

The Atlantic sturgeon is listed under the ESA as five DPS (NMFS, 2015b). Per consultations with NMFS, any of the five DPSs may occur in the ACP project area. The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs are listed as endangered. The Gulf of Maine DPS is listed as threatened. On June 3, 2016 NMFS proposed critical habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay DPS. Five units of critical habitat in the Chesapeake Bay area are proposed for the Atlantic sturgeon, and NMFS has PCH for the Carolina DPS; six units are proposed in North Carolina; ACP would cross two units of the Carolina DPS PCH.

The Atlantic sturgeon is a large, long-lived, anadromous member of the Acipenseridae family. The species is slow to mature and late to reproduce, living approximately 60 years in the wild. The body is heavy and cylindrical, and covered in bony plates. The belly is white, while the back is slate-black or dark olive in color. The species is characterized by a long snout with obvious barbels along the mouth. The barbels are used to search for snails, shellfish, crustaceans, worms, and small fish in bottom sediment. (NMFS, 2015b; FWS, 2016g).

The species is solitary and does not school together. Males move to freshwater rivers for spawning as early as February in the southern portions of the range, March and April in the Mid-Atlantic States, and May and June in Canadian waters. Females arrive approximately 1 month later, and lay 1 million to 2.5 million eggs at a time in deep, flowing water. Juveniles remain in their natal river for up to 5 years before moving to ocean waters (FWS, 2016g).

This species has suffered catastrophic population reductions due primarily to overharvest. In 1998, the Atlantic States Marine Fisheries Commission (ASMFC) closed the commercial Atlantic sturgeon fishery by issuing a moratorium on the harvest of the species until at least 2038 to allow stocks to recover (ASMFC, 2016; FWS, 2016g). For more information on the Atlantic sturgeon's natural history, distribution, and threats, refer to the Final Rule listing two DPSs published by the FWS on February 6, 2012 (FWS, 2012b).

Based on consultation with the Northeast Region of NMFS, the City of Chesapeake, Virginia, is the only location in the ACP project area where Atlantic sturgeon may be present. The proposed AP-3 lateral crosses the South Branch Elizabeth River (MP 81.8), which may contain Atlantic sturgeon from any one of the five DPSs. Adult or subadult Atlantic sturgeon may occur in foraging habitats in the South Branch Elizabeth River at any time of the year. The species also occurs in the James River, which is crossed by the AP-1 mainline route (MP 184.7) in Nelson and Buckingham Counties; however, the crossing is upstream of the Bosher Dam and there are no records of Atlantic sturgeon using the fish passage on the dam and spawning is not known to occur that far upriver.

The Status Review of the Atlantic sturgeon issued by NMFS in 2007 and consultation with the Southeast Region of NMFS identifies known occurrences of the species in the Roanoke River, which is crossed by the proposed AP-2 mainline approximately 7 river miles downstream from Roanoke Rapids, near Weldon, North Carolina at the Northampton and Halifax County line. There are North Carolina state records for Atlantic sturgeon in the Roanoke River, and fall spawning has been documented in the river near Weldon. The Roanoke River crossing on AP-2 (MP 9.8) crosses the Carolina Unit 1/Roanoke Unit of the Carolina DPS PCH. The Roanoke River crossing is expected to support spawning Atlantic sturgeon during spring and early summer spawning.

The Status Review also identifies occurrences of Atlantic sturgeon in the Cape Fear, Tar, and Neuse Rivers, each of which is crossed by the proposed AP-2 mainline route. The lock and dam #2 on the Cape Fear River likely prohibits sturgeon from traveling upstream to the proposed crossing location in Cumberland County. During the public comment period for Atlantic sturgeon PCH, NMFS received comments to move the proposed boundary of Atlantic sturgeon PCH within the Cape Fear River further upstream; NMFS' final determination on this suggested revision is anticipated in the summer of 2017 (NMFS, 2017b). Sturgeon likely cannot travel past the waterfall at Rocky Mount to reach the proposed crossing of the Tar River in Nash County. The Neuse River crossing on AP-2 (MP 98.5) mainline crosses the Carolina Unit 3/Neuse River Carolina DPS PCH.

The species has not been documented within the SHP project area. Presence for the species is assumed in the Roanoke, Neuse, and South Branch Elizabeth Rivers based on presence of suitable habitat, consultation with agencies, and available data. Therefore, Atlantic did not complete habitat assessment and occupancy surveys for the Atlantic sturgeon.

The Roanoke and South Branch Elizabeth Rivers would be crossed by the HDD method. Atlantic sturgeon inhabiting these rivers could be affected if an inadvertent return of drilling fluid used in the HDD crossings occurred. The drilling fluid, which consists primarily of water mixed with bentonite clay (and additives such as thickening agents), could affect water quality at the point of the release in or near the waterbody, which in turn could impact Atlantic sturgeon at or in the nearby downstream area. In a March 1, 2017 meeting between NMFS and Atlantic, NMFS also expressed concern regarding vibrations during HDD construction adversely affecting Atlantic sturgeon (NMFS, 2017a).

The Neuse River would be crossed by the cofferdam method, a dry crossing technique. In-stream construction activities and removal of riparian habitat along the Neuse River could temporarily increase sediment suspension and alter bottom substrates. Similarly, construction activities along access roads and within construction workspace adjacent to waterbodies, and traffic along access roads and the construction right-of-way, may cause sediment to reach the waterbody. Increased turbidity associated with in-stream activities may interfere with Atlantic sturgeon foraging by interfering with visibility. Increased sedimentation in waterbodies could also clog sturgeon gills or interfere with feeding and breeding behaviors. In-stream activities may directly cause mortality to individuals in the way of construction equipment, and equipment may damage or crush eggs. Blasting would not be required in the Neuse River.

NMFS requested additional information on the substrate of the Neuse River at the crossing location to determine if it could provide suitable spawning habitat for Atlantic sturgeon (NMFS, 2017a). Based on surveys conducted by Atlantic, the substrate at the Neuse River crossing is composed of 5 percent silt, 5 percent gravel, and 90 percent sand, which is not considered suitable spawning habitat for this species.

Water withdrawals are no longer proposed from the Roanoke, Neuse, and South Branch Elizabeth Rivers where Atlantic sturgeon may occur; therefore, no impacts from water withdrawal activities on Atlantic sturgeon are anticipated.

The use of the HDD on the Roanoke River and South Branch Elizabeth River would eliminate the need to conduct vegetation clearing at these waterbodies. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. This vegetation buffer would also reduce vibrations produced by the drill rig during HDD construction, minimizing potential vibration-related impacts on Atlantic sturgeon within the waterbody at the time of construction (NMFS, 2017a). Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies. Atlantic has designed HDDs to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in its *HDD Plan* (see appendix H), which includes measures to contain, clean-up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on Atlantic sturgeon, if present.

Atlantic has proposed utilizing the cofferdam method to cross the Neuse River. Atlantic would construct the crossing of the Neuse River outside of the February 1 through June 30 Atlantic sturgeon moratorium period to minimize impacts on the Atlantic sturgeon. Impacts on PCH would be temporary as the waterbody and PCH would be restored to preconstruction conditions upon completion of in-stream work. Apart from the presence of Atlantic sturgeon and the PCH, there are several other ESA under review and state-listed species that have either been confirmed or have the potential to occur within the Neuse River. Due to the number of sensitive aquatic species and habitat that have the potential to be present during construction activities, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a hydrofracture potential analysis for the Neuse River (AP-2 MP 98.5). If the potential for hydrofracture is low, Atlantic should utilize the HDD method at this crossing to reduce potential impacts on ESA-listed, proposed, and/or under review species. If the HDD method is not feasible, Atlantic should consult with the FWS and NCWRC to identify additional conservation measures that Atlantic will implement at this crossing to mitigate for the potential impacts on ESA-listed, proposed, and/or under review species.**

Atlantic has also committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1) at the Neuse River. To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques.

The FWS has expressed concern with sediment-laden discharge water from nearby access roads that could drain into waterbodies occupied by the Atlantic sturgeon. No ACP access roads would cross waterbodies with the potential to contain Atlantic sturgeon. Refer to section 4.6.4 for a more thorough discussion of potential impacts of sedimentation and turbidity resulting from in-stream construction activities, access road use, and runoff from the adjacent construction workspace and access roads on aquatic resources. Similarly, accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach fish-bearing waters, it could harm listed fish through exposure to chemical contaminants or petroleum products. As described in section 4.6.4, Atlantic would implement the measures in its *SPCC Plan* (see table 2.3.1-1), as well as FERC *Plan* and *Procedures* and, in addition to the FWS' enhanced erosion control measures for ESA sensitive waterbodies described in section 4.7.1, to minimize sedimentation, turbidity, and accidental spills to the extent possible during construction to reduce water quality impacts on the Atlantic sturgeon.

Therefore, we have determined that ACP *may affect* Atlantic sturgeon species (New York Bight, Chesapeake Bay, Carolina, South Atlantic and Gulf of Maine DPS); however, ACP is *not likely to adversely affect* Atlantic sturgeon species and is *not likely to adversely modify* the Carolina DPS PCH. ACP would have *no effect* on the other proposed Atlantic sturgeon PCH because they are not crossed by the project.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.9 Shortnose Sturgeon

The shortnose sturgeon is listed under the ESA as endangered throughout its range. Shortnose sturgeon are benthivores that feed on organisms that live on the substrate such as mollusks and crustaceans. The species is long-lived; maximum lifespan for females is 67 years and for males is 30 years. Age of maturity varies with growth rate, geographic location, and sex, ranging from 2 years of age for males in the southeastern United States to 15 years for females in Canada. Males spawn annually, whereas females spawn every 3 years on average (NMFS, 2015e).

The shortnose sturgeon has complex patterns in migration that vary by river system; it appears to use all areas of a river system throughout the year (NMFS, 2010b). The species is anadromous, migrating upstream from overwintering locations to spawning habitat during the late winter and early spring in southern rivers (NMFS, 2010b). It occurs primarily in slow-moving rivers and nearshore marine and estuarine habitats but migrates to higher velocity river habitats to spawn (NMFS, 2015e).

Shortnose sturgeon occur in most major river systems along the eastern coast of the United States, including the Chowan, Roanoke, Tar-Pamlico, Neuse, New, and Cape Fear river systems (NMFS, 2010b; NMFS, 2015e). Data are not available to estimate historic populations. Although shortnose sturgeon was not a target species for the commercial fishing industry, the species was historically overfished due to incidental capture in the Atlantic sturgeon fishery. Current threats to the species include dredging and disposal of sediment and other materials into rivers, dams that prevent upstream and downstream movement, habitat alteration, pollution, and development (NMFS, 2015e).

The shortnose sturgeon does not occur in the SHP project area. For ACP, shortnose sturgeon may occur in waterbodies inhabited by Atlantic sturgeon, including the Roanoke (AP-2; MP 9.8), Neuse (AP-2; MP 98.5), and South Branch Elizabeth (AP-3; MP 81.8) rivers (see section 4.7.1.8) (NMFS, 2017a; 2017b). NMFS did not recommend surveys for the shortnose sturgeon.

The impacts and conservation measures described in section 4.7.1.8 for the Atlantic sturgeon are the same for the shortnose sturgeon. NMFS has indicated that the conservation measures that Atlantic would implement to avoid and minimize impacts on Atlantic sturgeon would also be appropriate and sufficient for shortnose sturgeon (NMFS, 2017b).

Therefore, ACP *may affect* shortnose sturgeon; however, ACP is *not likely to adversely affect* shortnose sturgeon.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.10 Roanoke Logperch

The federally endangered Roanoke logperch is a large darter found in medium-to-large warm, clear streams and small rivers. The back is dark green, with elongated vertical marks along yellowish-green sides; the belly is yellowish or white. The fins are patterned, and the first dorsal fin displays a bright orange band along the top, especially noticeable in males (NCWRC, 2016a; FWS, 2015g).

The logperch is found in pools, riffles, and runs with sand, boulder or gravel substrate. Spawning takes place in the spring (April or May) on gravel or small cobble in deeper runs. The species feeds by using its snout to forage through gravel, feeding on macroinvertebrates (NCWRC, 2016a).

The species is endemic to the Chowan River basin in Virginia and Roanoke River basin in North Carolina and Virginia. Historical range may not have been much more extensive than the current range, but the construction of dams and impoundments have caused population declines. The extant populations are likely remnants of larger historical populations. For more information on the Roanoke logperch's natural history, distribution, and threats, refer to the 5-Year Review published by the FWS in 2007 (FWS, 2007c).

The Roanoke logperch is not found in the SHP area. Within the ACP project area, the species is found in larger streams in Roanoke, Smith, Pigg, Otter, and Nottoway River systems in Virginia and North Carolina. However, ACP does not cross these waterbodies in counties in North Carolina where the species is known to occur. It has been documented in Prince Edward, Nottoway, Dinwiddie, Brunswick, Greensville, Southampton, and Prince George Counties, Virginia. Species occurrence is based on a desktop review using the FWS IPaC website and consultations with the FWS. In Virginia, the AP-1 mainline and AP-3 lateral routes would cross the Nottoway and Roanoke River drainages. The AP-1 mainline also crosses a Roanoke logperch priority area located in Nottoway, Dinwiddie, and Brunswick Counties as identified in the Virginia FWS Ecological Services Strategic Plan (FWS, 2012c). Virginia NHI data also identified occurrences of the Roanoke logperch in the Nottoway River near Fort Pickett within 2 miles of a proposed access road in Brunswick County, and Virginia WERMS data identified occurrences within 2 miles of the ACP in Dinwiddie, Brunswick, and Nottoway Counties in Butterwood Creek, Nottoway River, White Oak Creek, and Waqua Creek.

In consultation with the Virginia and North Carolina FWS Field Offices, Atlantic developed a study plan for Roanoke logperch surveys in waterbodies to be crossed by ACP. The Virginia FWS Field Office indicates that Roanoke logperch have been documented at the Nottoway River and Waqua Creek; therefore, presence is assumed in these waterbodies and no further surveys will be conducted. The VDGIF indicates Roanoke logperch may be present in tributaries of Butterwood Creek (Dinwiddie County), Nottoway River (Dinwiddie County) on the AP-3 lateral, and Waqua Creek (Brunswick County) (VDGIF, 2015a). Additionally, the Virginia FWS Field Office indicates that suitable habitat occurs in perennial streams in the Nottoway watershed in Greensville, Brunswick, Dinwiddie, Nottoway, and Southampton Counties, and identified Butterwood Creek, Great Branch, and Sturgeon Creek as upstream tributaries of known occurrences which may contain suitable habitat.

Atlantic surveys observed Roanoke logperch at one waterbody crossing location on ACP. Based on historic presence and low detectability during surveys, Atlantic has assumed presence of Roanoke logperch at Sturgeon Creek, Waqua Creek, and both crossings of the Nottoway River. The VDGIF has recommended assumed presence of Roanoke logperch at Butterwood Creek (VDGIF, 2017a). Surveys are pending at Butterwood Creek (AP-1 MP 253.7); Atlantic would consult with the FWS regarding recommended conservation measures at Butterwood Creek pending the results of these surveys.

The Nottoway River on the AP-3 lateral would be crossed utilizing an HDD. Roanoke logperch inhabiting the Nottoway River could be affected if there is an inadvertent return of drilling fluid used in the HDD crossing. The drilling fluid, which consists primarily of water mixed with bentonite clay (and additives such as thickening agents), could affect water quality at the point of the release in or near the waterbody, which in turn could impact Roanoke logperch at or in the nearby downstream area.

Dry crossing methods (e.g., dam and pump or flume) are proposed at the three other waterbody crossing locations where there is suitable habitat and/or where Roanoke logperch presence is assumed or confirmed present. In-stream rock removal or blasting may also be required at these three waterbody crossings. Atlantic would use blasting to remove rock in the trenchline. If Roanoke logperch are in the waterbody adjacent to the blast, their swim bladders could burst from the sound pressure levels. Rock removal may also alter the streambed composition and hydrology at the crossing location. Due to the potential presence of Roanoke logperch, and potentially other ESA-listed species, the FWS has requested that Atlantic investigate utilizing the HDD method to cross Nottoway River (AP-1, MP 260.7). We agree, and therefore **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a hydrofracture potential analysis for the Nottoway River (AP-1 MP 260.7). If the hydrofracture potential is low, Atlantic should utilize the HDD method at this crossing to reduce potential impacts on ESA-listed, proposed, and/or under review species. If the HDD method is not feasible, Atlantic should consult with the FWS and VDGIF to identify additional conservation measures that Atlantic will implement at this crossing to mitigate for the potential impacts on ESA-listed, proposed, and/or under review species.**

In-stream construction activities and removal of riparian habitat along waterbodies with suitable habitat for Roanoke logperch could increase sediment suspension and alter bottom substrates. Similarly, construction activities along access roads and within construction workspace adjacent to waterbodies, and traffic along access roads and the construction right-of-way could cause increased runoff causing sediment to reach the waterbody. Increased turbidity associated with in-stream activities may interfere with Roanoke logperch foraging by interfering with visibility. Increased sedimentation in waterbodies could also clog Roanoke logperch gills or interfere with feeding and breeding behaviors. In-stream activities may cause mortality to individuals in the way of construction equipment, and equipment may damage or crush eggs. Refer to section 4.6.4 for additional discussion of construction-related impacts on aquatic species and their habitat.

Water withdrawals are no longer proposed in the waterbodies where Roanoke logperch are known or assumed present; therefore, no impacts from water withdrawal activities on Roanoke logperch are anticipated.

The use of the HDD method at the Nottoway River crossing location on the AP-3 lateral would eliminate the need to conduct vegetation clearing at that location. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. However, minor hand clearing of vegetation may occur at trenchless crossing methods to lay guidewires for construction or to place pumps for water withdrawal activities. Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies. Atlantic has designed HDDs to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in *HDD Plan* (see appendix H), which includes measures to contain, clean-up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on Roanoke logperch, if present.

Atlantic has also committed to implementing its *Virginia Fish Relocation Plan* (see table 2.3.1-1) at locations where in-water construction techniques would occur and where Roanoke logperch or suitable habitat were identified. Any species trapped within the areas proposed for dewatering or in-stream work areas would be removed and relocated to suitable habitat within 24 hours after the work area has been isolated. If water depth within the isolated work area is too deep to remove fish, and it has been determined that partial dewatering is necessary prior to removing fish, then the pump intakes would be screened to prevent fish and aquatic biota from entering the intake. Details of relocations of threatened and endangered fishes would be documented, photographed, and summarized in a single final report to be submitted to VDGIF and FWS. Unless otherwise authorized by VDGIF and the FWS, fish relocation efforts would not be conducted during applicable TOYR for Roanoke logperch. There is a potential for relocation efforts to cause mortality of individual Roanoke logperch due to stress or handling; however, by following the FWS and VDGIF approved protocols, the risk of individual losses would be minimized.

Atlantic would not conduct in-stream activities at the waterbodies where Roanoke logperch or suitable habitat were identified during the VDGIF TOYR (March 15 through June 30), or at the site of any in-stream work within 1 mile upstream of these waters, except for bridge installation at Waqua Creek and Sturgeon Creek. These bridges would provide a travel lane during construction and would require the installation of one center support proposed in May 2019 during the Roanoke logperch TOYR. The support installation would not require digging and minimal disturbance would occur to the stream bed. We recommend in section 4.7.4.2 that Atlantic consult with the VDGIF regarding the proposal to conduct in-stream activities during the Roanoke logperch TOYR.

As described in Atlantic's and DETI's *Restoration and Rehabilitation Plan* (see appendix F), Atlantic would restore riparian areas with native species across the entire width of the construction corridor. Forested riparian areas would be restored and enhanced using plantings of native tree and shrubs, excluding the permanent easement. Restoration of riparian areas would be designed to restore stream bank integrity, withstand periods of high flow, and would include temporary erosion control fencing until restoration is complete.

The FWS has expressed concern with sediment-laden discharge water from nearby access roads, that could drain into waterbodies occupied by the Roanoke logperch. No ACP access roads would cross waterbodies with the potential to contain Roanoke logperch. The bridge would require installation of one in-stream center support. Refer to section 4.6.4 for a more thorough discussion of potential impacts of sedimentation and turbidity resulting from in-stream construction activities, access road use, and runoff from the adjacent construction workspace and access roads on aquatic resources. Similarly, accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach fish bearing waters, it could harm listed fish through exposure to chemical contaminants or petroleum products. Atlantic would implement the measures in the FERC *Plan* and *Procedures* and Atlantic's and DETI's *SPCC Plan* (see table 2.3.1-1), in addition to the FWS' enhanced conservation measures for ESA sensitive waterbodies described in section 4.7.1, to minimize sedimentation, turbidity, and accidental spills to the extent possible during construction to reduce water quality impacts on the Roanoke logperch.

If Roanoke logperch are observed during additional survey efforts, the conservation measures described above would be followed in those waterbodies. Fish relocation activities are viewed by the FWS as take; as such ACP *may affect*, and is *likely to adversely affect* the Roanoke logperch.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.11 Carolina Madtom

The Carolina madtom is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and may be warranted for listing. A status review was initiated in September 2011; the listing decision is expected on or before September 30, 2017. If listing of the species is warranted, the FWS will publish a final rule listing the species concurrently with the decision. The FWS recommended addressing the Carolina madtom as the species may be proposed for listing and/or listed during the life of the project.

The Carolina madtom is a small fish identified by a short, tan body with three wide, dark saddle markings across the back, and a black stripe extending from the snout to the base of the tail. It is endemic to the Tar and Neuse River basins in North Carolina, and can be found in the larger streams that flow into these rivers. The species prefers free-flowing streams with sand or gravel bottoms and tends to avoid areas with large amounts of submerged vegetation. During the breeding season (May through July), adults move to areas with more moderate or slow flows and seek cover among debris piles and mussel shells which provide cover for nesting (NCWRC, 2016a and 2016b). Given the species is not listed, the FWS has not published a recovery plan or conducted a 5-year status review for the Carolina madtom.

Per FWS correspondence, this species is known from the Tar River, Fishing Creek, Little River, and Contentnea Creek, and the FWS indicated there is potential habitat for this species in the Neuse and Tar River watersheds in Halifax, Nash, Wilson, and Johnston Counties, North Carolina (FWS, 2015f). The NCWRC also indicated that the Carolina madtom is primarily known from the Neuse and Tar-Pamlico River drainages (NCWRC, 2014 and 2015b). NHI data listed occurrences of the Carolina madtom in Swift Creek, Fishing Creek, and Little River within 2 miles of ACP in Nash, Halifax, and Johnston Counties. The Carolina madtom has not been documented in the SHP project area.

Twenty-eight proposed ACP stream crossings have potentially suitable Carolina madtom habitat in the Tar and Neuse River drainages, including mainline, workspaces, and access roads. Atlantic surveyed second order and greater streams crossed by ACP in 2015 and 2016 for Carolina madtom suitable habitat and presence. Atlantic surveyed 23 of 28 streams identified via desktop analysis as having potentially suitable habitat. Surveys have identified two waterbodies crossed by ACP that have documented presence. These locations are not disclosed in this document to protect the species from over-collection, habitat degradation, and/or to respect the landowner, land-managing agency, and/or regulatory agency's request to restrict the release of the location information. Atlantic has assumed presence at Fishing Creek, Contentnea Creek, Tar River, and the Neuse River, North Carolina based on agency data. Surveys are pending at five sites at Beaverdam Swamp, Jacket Swamp, Sapony Creek, an unnamed tributary of Little Sapony Creek, and John K. Swamp, and are anticipated to be completed by July 2017. The FWS has indicated that Neuse River waterdog and Carolina madtom use similar habitats; however, Atlantic's January 27, 2017 BA identifies waterbodies that provide suitable habitat for Neuse River waterdog, but unsuitable habitat for Carolina madtom (see appendix K). Furthermore, the FWS has noted that the Carolina madtom has low detectability (less than 20 percent) during individual surveys; therefore, **we recommend that:**

- **<u>As part of its Implementation Plan</u>, Atlantic shall file revised Carolina madtom habitat assessments based on 2017 surveys and consultations with the FWS North Carolina Field Office. This information shall also be incorporated into the ACP Master Waterbody Crossing table. <u>During construction</u>, Atlantic should assume presence of the Carolina madtom where there is suitable habitat and implement the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities*, as well as the FWS' enhanced conservation measures for ESA sensitive waterbodies as defined in section 4.7.1 of the EIS.**

Five of the six waterbodies with known or assumed presence of Carolina madtom would be crossed utilizing the HDD method. This species could be affected if there is an inadvertent return of drilling fluid used in the crossing. The drilling fluid, which consists primarily of water mixed with bentonite clay (and additives such as thickening agents), could affect water quality at the point of the release in or near the waterbody, which in turn could impact Carolina madtom at or in the nearby downstream area.

The Neuse River, where Carolina madtoms are assumed to be present, would be crossed using the cofferdam method. In-stream activities may cause mortality of individuals in the way of construction equipment, and equipment may damage or crush eggs. In-stream construction activities and removal of riparian habitat along waterbodies with suitable habitat for the Carolina madtom could temporarily increase sediment suspension and alter bottom substrates. Similarly, construction activities along access roads and within construction workspace adjacent to waterbodies, and traffic along access roads and the construction right-of-way could cause sediment to reach the waterbody. Increased turbidity associated with in-stream activities may interfere with Carolina madtom foraging by interfering with visibility. Increased sedimentation in waterbodies could also clog Carolina madtom gills or interfere with feeding and breeding behaviors. No blasting or rock removal is proposed at the Neuse River. Refer to section 4.6.4 for additional discussion of construction-related impacts on aquatic species and their habitats.

Water withdrawal is proposed at Contentnea Creek where Carolina madtoms are assumed present (see section 4.3.2.7). Intake pumps have the potential for entrainment or impingement of individuals. Water withdrawals have the potential to reduce water flow volumes and velocities in streams, causing an increase in sedimentation, altering dissolved oxygen levels, and affecting water levels in streams altering habitat for the Carolina madtom.

The use of the HDD method at five of the six waterbodies where Carolina madtom is known or assumed to occur would eliminate the need to conduct vegetation clearing at those locations. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. However, minor hand clearing of vegetation may occur at trenchless crossings to lay guidewires for construction or to place pumps for water withdrawal activities. Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies. Atlantic has designed HDD crossings to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in *HDD Plan* (see appendix H), which includes measures to contain, clean-up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on Carolina madtoms, if present.

Atlantic has proposed utilizing the cofferdam method to cross the Neuse River where the Carolina madtom is assumed present. Due to the potential presence of Carolina madtoms, and other ESA-listed and under review and state-listed species, we recommend in section 4.7.1.8 that Atlantic investigate utilizing the HDD method to cross the Neuse River, and adopt this method if feasible.

Atlantic has also committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Removal of Carolina madtoms and other fish at the crossing prior to construction may cause stress, physical injury, or death to some individuals.

In waterbodies where additional surveys are needed, if Carolina madtoms are identified, the waterbody would be crossed using a dry crossing method, and individual madtoms would be removed from the crossing according to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction* Activities. If a dry crossing method and fish removal could not be completed at the waterbody, in-stream activities would be conducted outside of the breeding season (May through July) to minimize impacts on this species. In locations with potentially suitable habitat, waterbodies would be restored in accordance with waterbody crossing plans and permits and the FERC *Plan* and *Procedures* (see table 2.3.1-1). These habitats would be temporarily impacted, but restoration would return these waterbodies as near as practicable to their original condition.

The FWS has expressed concern regarding sediment-laden discharge water, or sedimentation from nearby access roads, that could drain into waterbodies occupied by the Carolina madtom. No ACP access roads would cross waterbodies with the potential to contain Carolina madtoms. Refer to section 4.6.4 for a more thorough discussion of potential impacts of sedimentation and turbidity resulting from in-stream construction activities, access road use, and runoff from the adjacent construction workspace and access roads on aquatic resources. Similarly, accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach fish bearing waters, it could harm listed fish through exposure to chemical contaminants or petroleum products. Atlantic would implement the measures in its *SPCC Plan* (see table 2.3.1-1), as well as the FERC *Plan* and *Procedures* and, in addition to the FWS' enhanced conservation measures for ESA sensitive waterbodies as described in section 4.7.1, to minimize sedimentation, turbidity, and accidental spills to the extent possible during construction to reduce water quality impacts on the Carolina madtom.

The Tar River HDD is planned to begin in March or April 2018 and would take approximately 60 days and use 1.2 million gallons of water. The Contentnea Creek HDD is anticipated to start in March or April 2019 and is also expected to take approximately 60 days and use 1.1 million gallons of water. Atlantic would minimize impacts resulting from water withdrawal on Neuse River waterdog at the Tar River by using 1 mm or smaller screens to minimize impingement/entrainment, limiting water withdrawal to not exceed 10 percent of instantaneous flow, ensuring that intake velocity does not exceed 0.25 f/s, and using floating intake structures to avoid impacts on stream bed.

An ESA determination is not applicable for the Carolina madtom because the species is not yet listed or proposed under the ESA. Implementation of the conservation measures identified above would minimize potential impacts on this species.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.12 Candy Darter

The candy darter is not currently listed under the ESA. It was petitioned for listing in April 2010. The FWS determined the petition had substantial information and may be warranted for listing, and initiated a status review in September 2011. The FWS is scheduled to determine if the candy darter warrants listing under the ESA during Fiscal Year 2017. The FWS recommended addressing the candy darter in this EIS because the species may be proposed for listing and/or listed during the life of the projects.

Suitable habitat for the candy darter includes riffles and runs of clear, rocky rivers and streams. Spawning occurs in mid- to late-spring around boulders and rubble (Helfrich et al., 2005). Primary threats to the candy darter are stream degradation and hybridization with the variegate darter (*Etheostoma variatum*) (WVDNR, 2017).

The species is endemic to the New River drainage in Virginia and West Virginia and currently has the potential to occur in Pocahontas County, West Virginia within the ACP project area (WVDNR, 2017). The candy darter has a documented distribution within the upstream reaches of the mainstem of the Greenbrier River and its tributaries. It has recently been documented in Knapp and Sitlington Creeks. NHI data indicate one known occurrence of the candy darter in Knapp Creek about 1.5 miles south of an ACP access road. During habitat assessments, Atlantic identified potentially suitable habitat for this species within Clover Creek, Glade Run, Thomas Creek, and Knapp Creek. Although the ACP route does not cross Knapp Creek, there would be temporary impacts associated with a contractor yard located adjacent to Knapp Creek. The candy darter is not documented and suitable habitat does not occur in the SHP project area.

The FWS did not recommend surveys for individual darters. Based on documented occurrence information, and Atlantic's habitat assessment, **we recommend that:**

- **If the candy darter is proposed or listed during the life of ACP, Atlantic should assume presence of the candy darter within Knapp Creek, Clover Creek, Glade Run, Thomas Creek, and the Greenbrier River, and apply the FWS' enhanced conservation measures for aquatic species outlined in section 4.7.1 of the EIS to these waterbodies, and any perennial tributaries within 1 mile of these crossing locations to minimize impacts on this species (see appendix K of the EIS)**.

An ESA determination is not applicable for the candy darter because this species is not yet listed or proposed under the ESA.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the GWNF. As discussed above, the candy darter has been documented in Knapp Creek; Atlantic proposes to develop a contractor yard that abuts Knapp Creek outside of the MNF where this species could occur. In addition, suitable habitat for this species likely occurs within the Greenbrier River, which is located approximately 0.1 mile downslope of the ACP crossing on the MNF. Based on Atlantic's erosion and sedimentation analysis, ACP is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds, which includes the construction workspace near Knapp Creek, Greenbrier River, Clover Creek, Glade Run, and Thomas Creek. To minimize these potential impacts, Atlantic would implement the sediment and erosion control measures outlined in the *COM Plan*, and would monitor turbidity at all state-designated coldwater fisheries on NFS lands as described in the Water Quality Monitoring Plan section of the *COM Plan* (appendix G). Atlantic would also implement the conservation measures described in the BE (see section 4.7.3).

4.7.1.13 Madison Cave Isopod

The federally threatened Madison Cave isopod is a colorless, eyeless crustacean adapted to flooded limestone caves and the waters of deep karst aquifers in Virginia and West Virginia. The body is flattened, with seven pairs of walking legs, including a modified pair of graspers near the head. Males are approximately 0.6 inch in length, and females are slightly larger at 0.7 inch. The species is thought to be carnivorous (FWS, 2010a).

The species is endemic to underground karst aquifer habitats and is restricted to the Shenandoah Valley, from Lexington, Virginia to Harpers Ferry, West Virginia. There are documented populations in the Waynesboro-Grottoes area of Augusta County, Virginia, the Harrisonburg area of Rockingham County, Virginia, and the valley of the main stem of the Shenandoah River in Warren and Clarke Counties, Virginia, and Jefferson County, West Virginia. Current population size is not known (FWS, 2010a). The FWS has not published a recovery plan or conducted a 5-year status review for the Madison Cave isopod.

A known population of the species is found in Augusta County, Virginia. The AP-1 mainline route also crosses a Madison Cave isopod priority area as identified by the FWS Virginia Field Office in their Ecological Services Strategic Action Plan (FWS, 2012c). The AP-1 mainline crosses medium probability suitable habitat between MPs 123.7 and 141.0 and high probability habitat between MPs 142.2 and 149.6. Barterbrook-Blue, Cochran's, and Burnsville Cove caves all are within 2 miles of ACP and may contain suitable habitat for Madison Cave isopod. The Barterbrook-Blue Cave is approximately 0.5 mile from ACP and within the Madison Cave isopod high probability priority area/suitable habitat. The Burnsville Cove Cave is approximately 0.2 mile from a proposed existing access road (Roberts Road), and is not within the Madison Cave isopod priority area/suitable habitat. The ACP mainline crosses the Cochran's Cave Conservation Site. The species is not found in the SHP project area. Species occurrence is based on a desktop review using the FWS IPaC website and on consultations with the FWS.

The proposed route traverses the Cochran's Cave Conservation Site near Staunton; the VDCR has identified this cave system as providing potentially suitable habitat for the Madison Cave isopod, although sampling conducted in 2015 did not identify individuals in the cave. The ACP mainline would cross the Cochran's Cave Conservation Site between MPs 139.8 and 140.4, but does not cross the known cave entrances (#2 and #3).

Atlantic conducted field surveys to identify and document karst features along the proposed mainline route in Virginia and West Virginia. Because of the interconnected network of karst features, actions in one area can produce impacts considerable distances from the actual point of activity. Thus, the area of interest was divided into two sections: a 0.5-mile-wide KRA (i.e., 0.25 mile on either side of the project centerline) and a 300-foot-wide corridor (i.e., 150 feet on either side of the project centerline). The KRA was reviewed for existing karst locations utilizing a variety of sources. Concurrent with this review, field surveys were conducted within the 300-foot-wide corridor. Only features located within or adjacent to the 300-foot-wide corridor were documented. If observed or mapped karst features received drainage from within the 300-foot-wide corridor, these features were delineated and documented to the extent possible. A total of 55 karst features, such as sinkholes, springs, cave entrances or open throat features were identified in Augusta County within the survey corridor and within the Madison Cave isopod priority area/suitable habitat (MPs 123.7 to 149.6).

Table 4.7.1-10 presents the karst features identified within the environmental survey corridor within the Madison Cave Isopod Priority Area in Augusta County, Virginia. In addition, this table identifies where Madison Cave isopod presence is assumed, and the conservation measures that would be implemented at each karst feature. Madison Cave isopod presence was assumed at open throat karst features and/or karst features with a potential drainage.

The FWS identified certain sensitive karst features noted with asterisk (*) in the Karst Feature ID column in table 4.7.1-10. Based on karst surveys, Atlantic determined that the following features do not have the potential for Madison Cave isopod based on the following field survey information:

- A131-1: feature is an active cornfield;
- A106-1: closed feature in a farm field;
- A162-1: feature is in a cornfield and filled with construction debris;
- A162-3: feature is in a farm field and full of farm waste;
- A148-1: closed feature in a pasture; and
- A148-2: closed feature in a pasture.

TABLE 4.7.1-10

Karst Features in Madison Cave Isopod Priority Area (Augusta County, Virginia) within 300 feet of the Atlantic Coast Pipeline

MP	Karst Feature ID	Feature Type	Risk Level [a]	Distance / Direction to Workspace or Access Road (feet)	Workspace Type [b]	Presence Assumed for Madison Cave Isopod (Y / N) [c]	Conservation Measures [d]
125.7	A029-2	Sinkhole, no throat drainage	Moderate	204 / W	Temp TS	N	None
125.7	A029-1	Sinkhole, no throat drainage	Moderate	147 / W	Temp TS	N	None
127.8	A057-1	Large throat, drainage	High	19 / W	Temp ROW	Y	25-foot no activity buffer, ESC measures
128.1	A057-2	Sinkhole, no throat drainage	Moderate	46 / E	Perm ROW	N	None
128.1	A057-3	Sinkhole, no throat drainage	Low	169 / E	Perm ROW	N	None
128.1	A057-4	Sinkhole, no throat drainage	Low	153 / E	Perm ROW	N	None
128.1	A057-5	Sinkhole, no throat drainage	Low	176 / E	Perm ROW	N	None
128.1	A057-6	Sinkhole, no throat drainage	Low	206 / E	Perm ROW	N	None
129.7	A072-2	Sinkhole, no throat	Moderate	76 / E	ATWS	N	None
129.7	A075-1	Sinkhole, no throat	Moderate	41 / W	ATWS	N	None
130.6	A083-1	Sinkhole, no throat drainage	Moderate	147 / W	Temp ROW	N	None
131.1	A086-2	Sinkhole, throat filled with cinder blocks	Moderate	118 / SE	Perm ROW	N	None
131.1	A086-1	Solution conduit, blind	Low	0	Temp ROW	N	None
131.1	A086-3	Sinkhole, no throat	Low	242 / SE	Perm ROW	N	None
131.4	A086-4	Sinkhole, failed farm pond, no throat	Low	114 / SE	Perm ROW	N	None
131.8	A092-1	Sinkhole, no throat	Low	17 / E	Perm ROW	N	None
132.2	A096-1	Solution conduit, drainage	Low	0	Perm ROW	N	Buffer and avoid if possible; otherwise install reverse graded filter
132.7	A096-2	Solution conduit, blind	Low	0	Perm ROW	N	None
132.8	A096-3	Sinkhole, subordinate sink in larger structure	Moderate	229 / E	Perm ROW	N	None

TABLE 4.7.1-10 (cont'd)

Karst Features in Madison Cave Isopod Priority Area (Augusta County, Virginia) within 300 feet of the Atlantic Coast Pipeline

MP	Karst Feature ID	Feature Type	Risk Level [a]	Distance / Direction to Workspace or Access Road (feet)	Workspace Type [b]	Presence Assumed for Madison Cave Isopod (Y / N) [c]	Conservation Measures [d]
132.8	A096-4	Sinkhole, subordinate sink in larger structure	Moderate	203 / E	Perm ROW	N	None
132.9	A096-5	Sinkhole, soil filled throat	Moderate	53 / E	Perm ROW	N	None
132.9	A096-6	Sinkhole, no throat	Low	143 / E	Perm ROW	N	None
132.9	A096-7	Sinkhole, collapsed sink	Low	34 / E	Perm ROW	N	None
132.9	A096-8	Open throat, sinking stream, deep conduit	High	0	Temp ROW	Y	25-foot no activity buffer, ESC measures
133.0	A097-1	Sinkhole, trash	Low	21 / E	Perm ROW	N	None
133.9	A105-1	Sinkhole, throat drainage	High	0	Perm ROW	Y	Impacts to 25-foot buffer are anticipated; install graded filter if avoidance to feature is not possible
134.1	A106-1*	Sinkhole in farmland, closed with drainage	High	0	Perm ROW	N	Install graded filter
137.2	A131-1*	Sinkhole, in cornfield, receives drainage	High	0	Temp TS	N	Install graded filter
137.3	A132-2*	Sinkhole, in pasture, receives drainage	High	0	Perm ROW	Y	Impacts to 25-foot buffer are anticipated; install graded filter
140.1	A140-1	Sinkhole, hayfield	Low	0	ATWS	N	Isolate from work area and buffer if possible; otherwise install graded filter
140.1	A140-4	Surface drain	High	152 / N	ATWS	Y	25-foot no activity buffer, ESC measures
140.1	A140-2	Cochran's Cave #3	High	168 / E	Temp ATWS	Y	25-foot no activity buffer, ESC measures
140.2	A142-1	Sinkhole	Low	260 / NE	Perm ROW	Y	25-foot no activity buffer, ESC measures
140.2	A142-3	Subordinate sink	Moderate	168 / NE	Perm ROW	Y	25-foot no activity buffer, ESC measures
140.2	A142-2	Sinkhole	Low	0	Perm ROW	Y	Impacts to 25-foot buffer are anticipated; install graded filter if avoidance to feature is not possible

TABLE 4.7.1-10 (cont'd)

Karst Features in Madison Cave Isopod Priority Area (Augusta County, Virginia) within 300 feet of the Atlantic Coast Pipeline

MP	Karst Feature ID	Feature Type	Risk Level [a]	Distance / Direction to Workspace or Access Road (feet)	Workspace Type [b]	Presence Assumed for Madison Cave Isopod (Y / N) [c]	Conservation Measures [d]
140.2	A142-5	Cochran's Cave #2 [e]	High	340 / NE	Perm ROW	Y	25-foot no activity buffer, ESC measures
140.2	A142-4	Cover collapse sink	Moderate	135 / NE	Perm ROW	Y	25-foot no activity buffer, ESC measures
140.3	A146-1	Sinkhole, drainage	Low	68 / W	Temp TS	N	None
140.9	A148-1*	Sinkhole, in pasture, closed, receives drainage	High	0	Perm ROW	N	Install graded filter
141.0	A148-2*	Sinkhole, in pasture, receives drainage	High	0	Temp ROW	N	Install graded filter
143.2	A153-1	Former sink, failed farm pond	Moderate	38 / SW	Temp ROW	N	None
144.9	A159.AR-1	Sinkhole, trash	Low	68 / NE	Perm ROW	N	None
144.9	A159.AR-2	Sinkhole, debris filled	Low	0	Perm ROW	N	Install graded filter
145.0	A159.AR-3	Sinkhole, drainage	High	0	Perm ROW	N	Install graded filter
145.6	A162-1*	Sinkhole, in cornfield, throat filled with construction debris	High	30 / E	Temp TS	N	None
145.7	A162-2*	Sinkhole, throats, receives drainage	Moderate	66 / E	Temp TS	Y	25-foot no activity buffer, ESC measures
145.8	A162-3*	Sinkhole, throats full of farm waste, receives drainage	Moderate	187 / E	Temp TS	N	None
145.9	A165-2*	Sinkhole, soil filled throats, receives drainage	Moderate	141 / NE	Temp TS	Y	25-foot no activity buffer, ESC measures
145.9	A165-1*	Sinkhole, throats, receives drainage	High	0	Perm ROW	Y	25-foot no activity buffer, ESC measures; install graded filter if needed
146.3	D006-1*	Sinkhole, throats, receives drainage	Moderate	90 / E	Temp TS	Y	25-foot no activity buffer, ESC measures
147.9	D040-1	Spring	Low	38 / W	Temp ROW	Y	25-foot no activity buffer, ESC measures

TABLE 4.7.1-10 (cont'd)

Karst Features in Madison Cave Isopod Priority Area (Augusta County, Virginia) within 300 feet of the Atlantic Coast Pipeline

MP	Karst Feature ID	Feature Type	Risk Level [a]	Distance / Direction to Workspace or Access Road (feet)	Workspace Type [b]	Presence Assumed for Madison Cave Isopod (Y / N) [c]	Conservation Measures [d]
148.6	A002-2	Sinkhole, receives drainage	Moderate	0	Perm ROW	Y	Impacts to 25-foot buffer are anticipated; install graded filter if avoidance to feature is not possible
148.7	A002-3	Sinkhole, with spring, receives drainage	Moderate	44 / W	Temp ROW	Y	25-foot no activity buffer, ESC measures
149.3	A003-2	Sinkhole, receives drainage	Moderate	5 / W	Temp ROW	Y	25-foot no activity buffer, ESC measures
149.3	A003-3	Sinkhole, receives drainage	High	0	Perm ROW	Y	25-foot no activity buffer, ESC measures

[a] Based on Atlantic's Karst Survey Report
[b] Perm ROW – Permanent Right-of-Way
Temp ROW – Temporary Right-of-Way
Temp TS – Temporary Topsoil Segregation Area
[c] Based on feature type and location within the Madison Cave isopod priority area.
[d] Additional erosion and sediment control (ESC) measures are described in section 4.7.1 and below.
[e] Cochran's Cave # 2 included even though more than 300 feet from workspace as it is known to contain Madison Cave isopod suitable habitat.
* Identified by the FWS as high priority Madison Cave isopod karst features
Rows that are shaded gray are within the Madison Cave isopod high probability suitable habitat; unshaded rows are located within the moderate probability suitable habitat.

Atlantic has identified 20 open throat sinkhole features where the presence of Madison Cave isopod is assumed, of which 9 are located within 25 feet of the trenchline and could be directly impacted by construction activities. If these features are connected to potentially occupied habitat, water and sediment movement from construction activities may transfer to subterranean habitats occupied by Madison Cave isopod, altering habitats used by the species. Increased sedimentation may cause death of Madison Cave isopod or alter habitats making them unusable by the species. During construction, discharge of runoff to sinkholes or sinking streams, filling of sinkholes, and alteration of cave entrances could lead to surface collapse, flooding, erosion and sedimentation, groundwater contamination, and degradation of subterranean habitat. Clearing vegetation from the right-of-way creates the potential for erosion of surface soils into karst features. Ground-disturbing activities and sedimentation could alter local hydrologic conditions causing degradation of water quality in subsurface karst habitats. Spills of fuel and other chemicals during project construction and maintenance activities could drain into sinkholes, caves, or sinking streams and potentially contaminate groundwater and adversely impact subterranean habitat. As noted above, because of the interconnected network of karst features, actions in one area can produce impacts considerable distances from the actual point of activity.

As discussed in section 4.1.2.3, the development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, as discussed in section 4.3.1.7, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's *Karst Mitigation Plan* (appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts. The VDCR-DNH and the Virginia Cave Board have endorsed the revised *Karst Mitigation Plan* as comprehensive and indicate that the measures included would reduce the potential risk posed by ACP to karst resources. In addition to the measures described in section 4.7.1, the following conservation measures would be implemented to minimize impacts on the Madison Cave isopod:

- Atlantic would alert the FWS and appropriate state agencies when work begins within the Madison Cave isopod priority area;
- hydrostatic test water would not be obtained from karst features (only free-flowing streams);
- hydrostatic test water would be discharged downgradient of flagged or marked buffer areas of sinkholes, fissures, or other karst features unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge. If water cannot be discharged downgradient of the flagged or buffered karst features, discharge would take place in uplands 300 feet from the flagged or buffered karst feature. If discharge 300 feet from the flagged or buffered karst feature is not practicable, Atlantic would utilize additional sediment and water flow control devices to minimize impacts;
- no insecticides, herbicides, or refueling would be allowed within 300 feet of open throat karst features;
- erosion and sediment control measures would be used to minimize impacts on downslope karst features within 300 feet of the workspace;
- no activities would be allowed within 25 feet of open throat karst features within 300 feet of the workspace;
- HDDs would not be used in karst terrain;
- any spills within 100 feet upslope of karst features with the potential to contain Madison Cave isopod as identified in table 4.7.1-10 would be reported to the appropriate FWS office within 24 hours of identification for input on species-specific mitigation;
- Atlantic would employ a karst specialist during construction in karst terrain. Should excavation or trenching expose previously unidentified voids or conduits within the Madison Cave isopod priority area, the karst specialist would determine the appropriate restorative measures to protect the feature and groundwater and have oversight of the activity. Atlantic would contact the FWS Virginia Field Office immediately, and have an on-call Biological Monitor to investigate the exposure of any previously unidentified voids or conduits that occur within the Madison Cave isopod priority area;
- Atlantic would conduct blasting in a manner that would not compromise the structural integrity or alter the karst hydrology of known or inferred subsurface karst structures. If voids greater than 6 inches within the first 10 feet of bedrock are encountered during track drilling, then blasting would not be used, or subsurface investigation would be conducted to determine if the voids have connectivity with a deeper structure;
- Atlantic would develop site-specific blasting plans for blasting occurring within the Madison Cave isopod priority area (AP-1 MPs 123.7 to 149.6) and near Cochran's Cave

entrances #2 and #3 and submit them to the FWS and the appropriate state agency in accordance with the notification requirements prior, to blasting; and

- to avoid OHV access along the pipeline rights-of way and access roads, Atlantic and DETI have committed to implementing measures such as installation of OHV barriers (e.g., signs, fences, vegetation, or boulders). Barriers would be strategically placed to present physical barriers and to erase visual cues signaling the presence of the right-of-way from the access point. Atlantic and DETI would coordinate with the appropriate landowners and/or land managing agencies to identify locations where unauthorized OHV access is most likely to occur, and to develop the appropriate OHV blocking measures. At key crossing locations, site-specific OHV blocking measures would be developed in consultation with the land-managing agencies and adjacent private landowners, as appropriate.

The VDCR-DNH and Virginia Cave Board have made additional recommendations to address impacts if mitigation and protective measures fail and there is a discharge into karst waters, potentially impacting subsurface habitat, drinking water, and surface streams fed by karst springs. The FWS West Virginia and Virginia Field Offices also continue to express concern regarding the potential for trenching, blasting, and water discharge activities to impact subterranean karst features and karst waters that could indirectly impact Madison Cave isopod suitable habitat. On January 27, 2017, Atlantic submitted the Cochran's Cave Conservation Area and Moffet Lake Investigation Update, which provides the results of subsurface karst surveys and hydrological studies. The VDCR continues to recommend avoidance of the Cochran's Cave Conservation Site, but believes the current investigations and ongoing adjustments to the route have reduced the likelihood of a significant impact to the cave or its associated biological and hydrological resources (VDCR, 2017e). Atlantic would perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way. The locations of known or suspected karst features scheduled for ERI and/or air track drilling survey would include surveys of karst features located within the Madison Cave isopod priority area (AP-1 MPs 123.7-149.6).

As noted above, additional karst terrain surveys are pending along the ACP construction right-of-way and along proposed access roads within the Madison Cave isopod priority area. Therefore, **we recommend that:**

- **<u>Prior to construction, but following tree clearing</u>, Atlantic should:**

  a. conduct ERI and/or air track drilling surveys of the karst features identified during 2017 karst surveys that are within the construction workspace within the Madison Cave isopod priority area, including along proposed access roads;

  b. file a report(s) documenting these surveys with the Secretary, and the appropriate federal and state agencies; and

  c. if data suggests that construction activities have the potential to impact subsurface karst features that are connected to downstream Madison Cave isopod suitable habitat (based on the ERI and/or air track drilling surveys), Atlantic should consult with the FERC staff, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on this species and its habitat.

Atlantic's and DETI's *Karst Mitigation Plan* (appendix I) and the conservation measures above would be implemented to avoid or minimize potential impacts on the Madison Cave isopod; however, due to the limited distribution of this species, alignment of the ACP route across moderate and high probability suitable habitat, and its' high vulnerability to anthropogenic disturbance, it is possible that impacts associated with construction activities could have population level effects on this species.

Therefore, we have determined that ACP *may affect*, and is *likely to adversely affect* the Madison Cave isopod. However, in the absence of subterranean karst feature mapping that would indicate the potential for and magnitude of construction-related downstream impacts on the Madison Cave isopod priority area, the FWS is unable to quantify the potential incidental take of this species. This information is required to inform the Biological Opinion and complete section 7 consultation. Pending the results of these data, additional conservation measures may also be required by the FWS to mitigate impacts on this species.

National Forest System Lands

The Madison Cave isopod has the potential to occur within the GWNF; however, based on data obtained from the VDCR, the Madison Cave isopod priority area containing suitable habitat is located 0.75 mile from the proposed ACP centerline across the GWNF. During karst surveys, no caves or open throat karst features that could provide direct surface drainage into the subterranean environment were identified within 300 feet of the proposed ACP route on the GWNF. Karst terrain is found between AP-1 MPs 96.8 and 97.2, 105.9 and 106.1, and 122.8 and 123.2, and construction activities such as blasting could cause the formation of surficial karst features that could allow unfiltered and unimpeded flow of surface drainage into the subterranean environment. This could alter water flow patterns or increase sediment and contaminant loads, which could lead to a reduction or degradation of available habitat. Madison Cave isopod habitat is susceptible to contamination due to the porosity of the substrate. Blasting, trenching, and digging can cause shifts in surface and subsurface formations and hydrology, and may crush isopods or alter travel corridors (FWS, 2011i). Atlantic would implement the *Karst Mitigation Plan* (appendix I) to mitigate the potential for formation of surficial karst features, and to mitigate increased erosion and sedimentation into these features if they are identified or form during construction activities. Atlantic has also committed to conducting ERI and/or air track drilling of the karst features identified on the GWNF in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way. The conservation measures and our recommendations described above would also apply on NFS lands.

4.7.1.14 Chowanoke Crayfish

The Chowanoke crayfish is not currently listed under the ESA. It was petitioned for listing in April 2010, and the FWS determined the petition had substantial information and listing may be warranted. A status review was initiated in September 2011; the listing decision is expected on or before September 2019. If listing of the species is warranted, the FWS will publish a final rule listing the species approximately 12 months later. The FWS recommended addressing the Chowanoke crayfish in this draft EIS because the species may be proposed for listing and/or listed during the life of the project.

The Chowanoke crayfish is a small, light-colored crayfish with dark saddle markings on the body and orange and black bands on the chelae. It is found in sluggish woodland streams in sandy or gravel substrates (Center for Biological Diversity [CBD], 2010). The species is found in Virginia and North Carolina in the Lower Roanoke, Nottoway, and Meherrin watersheds. In the ACP project area, suitable habitat occurs in the Roanoke River basin in Halifax and Northampton Counties, North Carolina, and is known to occur in the mainstem of the Roanoke River (FWS, 2015f). North Carolina NHI listed occurrences of the Chowanoke crayfish in the Meherrin River within 2 miles of the ACP mainline in Northampton County.

The FWS Virginia Field Office did not provide locations where Chowanoke crayfish may be found in the ACP project area. The VDCR indicated that this species has been documented at Nottoway River-Fort Pickett SCU, and identified the potential for the species in Waqua Creek (VDCR, 2016b). Virginia NHI data listed occurrences of the Chowanoke crayfish in Fountains Creek within 2 miles of the ACP mainline in Greensville County, Virginia and within 2 miles of the ACP mainline in Brunswick County, Virginia. Virginia WERMS data listed occurrences of the Chowanoke crayfish in the Nottoway and Meherrin River drainages within 2 miles of ACP in Greensville and Dinwiddie Counties. The FWS has not published a recovery plan or conducted a 5-year status review for the Chowanoke crayfish.

Field surveys conducted in 2015, 2016, and 2017 in the Roanoke drainage did not identify the presence of Chowanoke crayfish in North Carolina. Based on agency data, Atlantic would assume presence for Chowanoke crayfish at the Roanoke River. Surveys for this species were not conducted in Virginia.

The Roanoke River, where Chowanoke crayfish are assumed present, would be crossed utilizing the HDD method. This species could be affected if there is an inadvertent return of drilling fluid used in the crossing. The drilling fluid, which consists primarily of water mixed with bentonite clay (and additives such as thickening agents), could affect water quality at the point of the release in or near the waterbody, which in turn could impact Chowanoke crayfish at or in the nearby downstream area.

Waterbodies identified as having suitable habitat for the Chowanoke crayfish, but where no crayfish were observed would be crossed using either wet or dry (e.g., dam and pump) crossing techniques. In-stream activities may cause mortality of individuals in the way of construction equipment, and equipment may damage or crush eggs. In-stream construction activities and removal of riparian habitat along waterbodies with suitable habitat for Chowanoke crayfish could temporarily increase sediment suspension and alter bottom substrates. Similarly, construction activities along access roads and within construction workspace adjacent to waterbodies, and traffic along access roads and the construction right-of-way could cause sediment to reach the waterbody. Increased turbidity associated with in-stream activities may interfere with Chowanoke crayfish foraging by interfering with visibility. Increased sedimentation in waterbodies could also interfere with feeding and breeding behaviors. No blasting or rock removal is proposed at this waterbody. Refer to section 4.6.4 for additional discussion of construction-related impacts on aquatic species and their habitats.

Water withdrawals are no longer proposed at the Roanoke River; therefore, no impacts from water withdrawals on Chowanoke crayfish are anticipated.

The use of the HDD method at the Roanoke River would eliminate the need to conduct vegetation clearing at that location. A vegetation buffer would be maintained, reducing the chance of siltation and unauthorized recreational access to these crossings. However, minor hand clearing of vegetation may occur at trenchless crossings to lay guide wires for construction or to place pumps for water withdrawal activities. Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies. Atlantic has designed HDD crossings to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in its *HDD Plan* (see appendix H), which includes measures to contain, clean up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on Chowanoke crayfish, if present.

Atlantic has also committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from workspaces prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Removal of Chowanoke crayfish and aquatic species at the crossing prior to construction may cause stress, physical injury, or death to some individuals.

In waterbodies where additional surveys are needed, if Chowanoke crayfish are identified, the waterbody would be crossed using a dry crossing method, and Chowanoke crayfish would be removed from the crossing according to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities*. If a dry crossing method and fish removal could not be completed at the waterbody, in-stream activities would be conducted outside of the breeding season (May through August) to minimize impacts on this species. In locations with potentially suitable habitat, waterbodies would be restored in accordance with waterbody crossing plans and permits and the FERC *Plan* and *Procedures* (see table 2.3.1-1). These habitats would be temporarily impacted, but restoration would return these waterbodies as near as practicable to their original condition.

The FWS has expressed concern with sediment-laden discharge water from nearby access roads, that could drain into waterbodies occupied by the Chowanoke crayfish. No ACP access roads would cross waterbodies with the potential to contain Chowanoke crayfish. Refer to section 4.6.4 for a more thorough discussion of potential impacts of sedimentation and turbidity resulting from in-stream construction activities, access road use, and runoff from the adjacent construction workspace and access roads on aquatic resources. Similarly, accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach waterbodies with aquatic species, it could harm listed aquatic species through exposure to chemical contaminants or petroleum products. Atlantic would implement the measures in the FERC *Plan* and *Procedures* and Atlantic's *SPCC Plan* (see table 2.3.1-1), in addition to the FWS' enhanced conservation measures for ESA sensitive waterbodies as described in section 4.7.1, to minimize sedimentation, turbidity, and accidental spills to the extent possible during construction to reduce water quality impacts on the Chowanoke crayfish.

An ESA determination is not applicable for the Chowanoke crayfish because the species is not yet listed or proposed under the ESA. Implementation of the conservation measures identified above would minimize potential impacts to this species.

National Forest System Lands

Suitable habitat for this species does not occur on NFS lands within the MNF or GWNF.

4.7.1.15 Freshwater Mussels

Five ESA-listed mussel species have been documented in the ACP and SHP project areas in West Virginia, Virginia, and North Carolina: dwarf wedgemussel, clubshell, James spinymussel, Tar River spinymussel, and snuffbox. No ESA-listed mussel species occur in the SHP project area in Pennsylvania. One mussel species (yellow lance) that the FWS has proposed for listing occurs in the ACP project area. Two mussel species (Atlantic pigtoe and green floater) that the FWS is currently reviewing for listing under the ESA have been documented in ACP and SHP project areas.

Atlantic and DETI developed state-specific mussel survey plans for each state and commonwealth along ACP and SHP routes. Atlantic and DETI employed a licensed malacologist to identify waterbodies in which ESA-listed, proposed, or under review mussel species may occur based on established protocols, Natural Heritage Data, FWS technical assistance letters, and consultation information for ACP and SHP.

Atlantic and DETI conducted habitat assessments and surveys for occupancy according to FWS-approved study plans along the pipeline corridor, access roads, and workspaces for ACP and SHP. Criteria that Atlantic and DETI used to evaluate the potential for presence of freshwater mussels include watershed size, upstream drainage area, stream type (i.e., ephemeral, intermittent, or perennial), and existing data on mussel occurrence. In North Carolina and Virginia, the FWS has instructed that surveys for ESA-listed mussel surveys would not be necessary where Atlantic intend to use the HDD crossing method. Atlantic and DETI are currently conducting habitat assessments and surveys for federal- and state-protected mussels in 26 waterbody crossings in Virginia and 8 waterbody crossings in North Carolina.

Dwarf Wedgemussel

The dwarf wedgemussel is a federally endangered freshwater mussel with no designated critical habitat (FWS, 2013b). Dwarf wedgemussels are found in a variety of habitats and across a range of stream sizes, substrates, and flow conditions. The species occurs in small streams less than 5 meters wide to large rivers greater than 100 meters wide. Similarly, it is found across a range of substrate types, including sand, clay, gravel, sand, pebble, and sometimes silt in depositional areas near banks. Dwarf wedgemussels are reported to reproduce from February to late August and are thought to be long-term brooders (FWS, 2015f). Biologically limiting aspects of the species' life history that contribute to the species' endangerment include a short life span, high degree of host specificity, low reproductive rate, low population densities, and limited dispersal ability of its primary host (FWS, 2015h).

Historically, the species occurred from New Brunswick, Canada to North Carolina (Neuse River) in 15 major Atlantic river systems. The dwarf wedgemussel is now extinct throughout Canada, extirpated in the Neuse River, and present in low densities throughout most of its range. Most populations are small and isolated (FWS, 2015h). For more information on the dwarf wedgemussel's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2013b).

According to FWS IPaC information, this species has the potential to occur in Nottoway County, Virginia, and Halifax, Nash, Wilson, and Johnston Counties, North Carolina. The FWS North Carolina Field Office identified potential habitat for the dwarf wedgemussel in perennial streams within the Neuse and Tar River watersheds in Halifax, Nash, Wilson, and Johnston Counties, North Carolina. The FWS also indicated that the dwarf wedgemussel is known to occur in Stony Creek, Rocky Swamp, Little River, an Unnamed Tributary to Sapony Creek, Millstone Creek, and Marsh Swamp, North Carolina. North Carolina NHI data listed occurrences of the dwarf wedgemussel in Rocky Swamp/Buffalo River confluence within 2 miles of the ACP mainline in Halifax and Johnston Counties.

The FWS Virginia Field Office identified the potential for dwarf wedgemussels in perennial streams within the Nottoway watershed in Brunswick, Dinwiddie, and Nottoway Counties. Known occurrences are in the Nottoway River, Virginia (VDGIF, 2016d). The VDGIF has indicated that dwarf wedgemussels also have the potential to occur in Sturgeon Creek in Brunswick County, Virginia (VDGIF, 2017b). Virginia WERMs data identified occurrences within 2 miles of ACP in Dinwiddie and Brunswick Counties in the Nottoway River.

Atlantic did not document dwarf wedgemussel individuals at ACP waterbody crossings in 2015 or 2016. The FWS recommended that Atlantic assume presence of the species in Rocky Swamp and Little River in North Carolina and Nottoway River (both crossings) in Virginia because it has previously been documented in these waterbodies. On ACP, final survey results for the dwarf wedgemussel are pending 2017 surveys including in the Neuse and Tar River watersheds in North Carolina and the Nottoway River watershed in Virginia. Based on information provided by the VDGIF, we recommend in appendix K that Atlantic assume presence of dwarf wedgemussel in Sturgeon Creek. The dwarf wedgemussel is not documented and suitable habitat does not occur in the SHP area.

Clubshell

The clubshell is a federally endangered freshwater mussel with no designated critical habitat. Clubshells typically are found in clean and stable runs of medium to small waterbodies, oftentimes immediately downstream of riffles. Typical substrates in which the species lives are gravel and coarse sand. More than 70 percent of clubshell populations may be below the substrate at depths of 2 to 4 inches (FWS, 2008c). Although the clubshell has a long lifespan (20 years), juvenile survival rates are low. Because of their tendency to occur underneath the substrate, clubshell populations can be difficult to detect when densities are low, which may lead to poorly defined distributions and incorrect population estimates. Clubshells are known to breed from mid-May to late July (FWS, 1994).

The clubshell was historically widespread throughout the majority of the Ohio River and Maumee River watersheds and was considered very common (FWS, 1994). The clubshell is now limited to 13 populations in the Ohio River and Lake Erie watersheds that occur across 21 streams; recent successful recruitment is evident in 9 streams. For more information on the clubshell's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2008c).

According to FWS IPaC information, this species has the potential to occur in Harrison, Lewis, Upshur, Doddridge, Tyler, and Wetzel Counties, West Virginia. West Virginia NHI identified occurrences of clubshell mussels within 2 miles of an ACP access road in Lewis County. On ACP, presence of the clubshell is assumed in the Hacker's Creek in Lewis County, West Virginia. Atlantic and DETI have completed surveys for the clubshell.

James Spinymussel

The James spinymussel is a federally endangered freshwater mussel with no designated critical habitat. Suitable habitat of the James spinymussel is in free-flowing streams of varying flow regime and silt-free substrates (FWS, 2011a). It is a short-term summer brooder, reproducing from late May through early August with most larvae released from June through late July (Hove and Neves, 1994).

Historically, the species was widespread throughout the James River watershed (FWS, 1990). By 1990, the species was restricted to populations in 10 streams; many of these populations were restricted and small (Hove, 1990 as cited in FWS, 1990; FWS, 1990). The species is currently known from the headwaters of small tributaries of the upper James River watershed in West Virginia and Virginia (FWS, 2011a). For more information on the James spinymussel's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2011a).

According to FWS IPaC information, this species has the potential to occur in Highland, Bath, Augusta, Nelson, Buckingham, Rockbridge, and Fluvanna Counties, Virginia. The James spinymussel may occur in perennial streams within the James River watershed in Highland, Bath, Augusta, Nelson, Buckingham, Rockbridge, and Fluvanna Counties, Virginia. According to the FS, the James spinymussel is known to occur in the Bullpasture River (no longer crossed by ACP), Cowpasture River, and Mill Creek (Bath County), and there is potentially suitable habitat in Calfpasture River and Jackson River. The VDGIF also indicated that James spinymussels may be present in the James River drainage in Bath County, and are known to occur in the Cowpasture River (VDGIF, 2016d). In addition, the Virginia WERMs data identified occurrences within 2 miles of ACP in the Cowpasture River in Bath County.

Atlantic did not identify James spinymussels during surveys in Virginia in 2015 or 2016. On ACP, final survey results for the James spinymussel are pending 2017 surveys, including in Jackson River, Cowpasture River, Calfpasture River, and Mill Creek. The FWS Virginia Field Office indicated that Atlantic should assume presence of the James spinymussel in Mill Creek. The VDGIF indicated in its

February 7, 2017 letter that James spinymussel (Virginia state endangered) may occur in both the Jackson River (AP-1 MP 91.5) and Back Creek (AP-1 MP 87.2) based on their adjacency to occupied sub-watersheds, and recommend adherence to the VDGIF TOYR (May 15-July 31) in these waterbodies. Atlantic conducted surveys at Back Creek, and no mussels were observed. However, surveys are pending at Jackson River. Therefore, we have recommended in appendix K that Atlantic assume presence of the James spinymussel in the Jackson River. This species is not documented in the SHP project area.

Tar River Spinymussel

The Tar River spinymussel is a federally endangered freshwater mussel with no designated critical habitat. The Tar River spinymussel occurs in portions of streams that are fast-flowing, well oxygenated, and generally silt-free with substrates of coarse sand and gravel. Females become reproductively active in late May to early June, and larvae are released by end of June. The species is typically found in small numbers in multi-species assemblages. The Tar River spinymussel is one of three species of freshwater mussels in the world with spines. Populations of the species are small to extremely small, isolated, highly fragmented, and often with low genetic viability (FWS, 2015i).

According to FWS IPaC information, this species has the potential to occur in Halifax, Nash, and Johnston Counties, North Carolina. The Tar River spinymussel is endemic to the Neuse River and Tar River systems. In the Tar River system, individuals have been documented in the Tar River mainstem, Fishing Creek, and Swift Creek. In the Neuse River system, the species has been documented solely from the Little River (FWS, 2015f). Recent survey data suggest that the species may be extirpated from the Tar River mainstem (FWS, 2015i). NHI occurrences are documented in Fishing Creek, Swift Creek, and Little River within 2 miles of ACP in Halifax, Nash, and Johnston Counties, North Carolina. For more information on the Tar River spinymussel's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2014c).

Atlantic conducted surveys in Fishing Creek, Swift Creek, and Little River and did not identify any ESA-listed mussels; however, Atlantic will assume presence in these waterbodies. Presence is also assumed in the Tar River. On ACP, final 2017 survey results for the Tar River spinymussel are expected in October 2017. The Tar River spinymussel has not been documented in waterbodies in the SHP project area.

Snuffbox

The snuffbox is a federally endangered freshwater mussel with no designated critical habitat. The species typically occurs in small- to medium-sized streams in areas with a swift current, although it is also found in larger rivers and Lake Erie. Adults often live deep in gravel, cobble, or sand substrates, except when spawning or attracting host fish. Breeding is initiated by increased water temperatures, and reproduction generally occurs from mid-July to August (FWS, 2015j).

The snuffbox's historic distribution included 210 streams and lakes in 18 states and Ontario, Canada. The current distribution has been reduced to 79 streams and lakes in 14 states and Ontario, representing a 62 percent rangewide decline. Most remaining populations are small and isolated, which increases the species' extinction risk (FWS, 2015j). The FWS has not published a recovery plan or conducted a 5-year status review for the snuffbox.

On SHP, snuffbox mussels are identified by IPaC as occurring in Westmoreland County, Pennsylvania, and Doddridge, Tyler, Wetzel, and Marshall Counties, West Virginia. On ACP, although the snuffbox may occur in all perennial waterbodies in Harrison, Lewis, and Upshur Counties, West Virginia, Atlantic determined through desktop analysis that only one perennial stream, the West Fork River, met the upstream watershed area requirements of 10 square kilometers to support ESA-listed mussels. Atlantic surveyed the West Fork River, but did not document snuffbox in West Fork River or other waterbodies surveyed in West Virginia. However, Atlantic will assume presence of snuffbox mussels in the West Fork River on ACP based on historic occurrence data. Similarly, DETI did not document individual snuffbox during surveys in waterbodies in the SHP project area, but would assume presence of this species in McElroy Creek.

Yellow Lance

The yellow lance is not currently listed under the ESA. It was petitioned for listing in April 2010; the FWS determined the petition had substantial information and listing may be warranted, and it initiated a status review in September 2011. On April 5, 2017, the FWS proposed to list the yellow lance under the ESA as a threatened species. Under the ESA, although there are no protections in place for proposed species, federal agencies are required to confer with the FWS on agency actions that may be likely to jeopardize a proposed species. The FWS will typically finalize or withdraw a listing about 12 months after a proposal depending on comments received; ESA protections become effective 30 days after a final listing rule is published.

The yellow lance typically occurs in small to medium-sized streams and rivers on sand or gravel substrates (NCWRC, 2016a). Potential habitat for the yellow lance in the project area occurs in perennial streams in Halifax, Nash, and Johnston Counties, North Carolina. Waterbodies crossed by the ACP proposed route in the Tar and Neuse River basins include but are not limited to: the Tar River mainstem, Swift Creek, and Little River. North Carolina NHI data have documented occurrences of the yellow lance in Swift Creek and Little River within 2 miles of ACP in Nash and Johnston Counties.

In Virginia, the yellow lance is known to occur in the Cowpasture River, Nottoway River, Meherrin River, and Sturgeon Creek near the ACP project area. Virginia NHI data listed occurrences of the yellow lance in the Nottoway River and James River within 2 miles of ACP in Southampton and Nelson Counties, and the Virginia WERMS data identified occurrences within 2 miles in the Nottoway River in Brunswick, Dinwiddie, and Southampton Counties.

Atlantic did not document yellow lance individuals during surveys in 2015 or 2016. On ACP, final 2017 survey results for the yellow lance are expected in October 2017. Presence of the yellow lance is assumed in Nottoway River (both crossings) in Virginia, and in Swift Creek, Tar River, Fishing Creek, and Little River in North Carolina. The yellow lance has not been documented in waterbodies in the SHP project area.

Atlantic Pigtoe

The Atlantic pigtoe is not currently listed under the ESA. It was petitioned for listing in April 2010; the FWS determined the petition had substantial information and may be warranted for listing, and initiated a status review in September 2011. The FWS is scheduled to determine if the Atlantic pigtoe warrants listing under the ESA on or before September 30, 2017. The FWS recommended addressing the Atlantic pigtoe in this EIS because the species may be proposed for listing and/or listed during the life of the projects.

The Atlantic pigtoe typically occurs in medium to large streams in clean, fast-running waters with stable substrate (gravel or sand). The species generally lives near the downstream boundary of riffle areas (NCWRC, 2016a).

According to FWS IPaC information, the Atlantic pigtoe has the potential to occur in Bath, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, Greensville, Southampton, Rockbridge, and Fluvanna Counties, Virginia, and in undetermined counties in North Carolina. The Atlantic pigtoe may be found in the James River basin in Virginia; it is known to occur in portions of the Appomattox River, Nottoway River, and Sturgeon Creek in Virginia (VDGIF, 2016d). According to the FS, it is also known from Mill Creek, Bath County. Virginia NHI data listed occurrences of the Atlantic pigtoe in the Nottoway River near Fort Pickett within 2 miles of ACP in Brunswick County. Virginia WERMs data identified occurrences within 2 miles of ACP in Dinwiddie, Brunswick, Greensville, Prince Edward, and Cumberland Counties in the Nottoway River, Sturgeon Creek, Meherrin River, and Appomattox River (VDCR, 2016b).

Potential habitat for the Atlantic pigtoe occurs in perennial streams in Northampton, Halifax, Nash, Wilson, Johnston, and Cumberland Counties, North Carolina. Waterbodies crossed by the proposed ACP route in the Tar and Neuse River basins include but are not limited to: the Tar River mainstem, Fishing Creek, Swift Creek, Little River, Quankey Creek, and Little Quankey Creek. North Carolina NHI data listed occurrences in the Fishing Creek subbasin, Swift Creek subbasin, Little River, and Contentnea Creek within 2 miles of ACP in Nash, Halifax, Johnston, and Wilson Counties.

On ACP, Atlantic has documented Atlantic pigtoe in the two waterbodies in Virginia, and four waterbodies in North Carolina. Presence is assumed in Mill Creek, Nottoway River (AP-3, MP 32.6), and Appomattox River in Virginia, and Roanoke River, Little River, and Cape Fear River in North Carolina. In its February 7, 2017 letter, the VDGIF also recommended that Atlantic assume presence of Atlantic pigtoe (Virginia state threatened species) in the Meherrin River based on historic occurrence data.

On ACP, final 2017 survey results for the Atlantic pigtoe are expected in October 2017. Atlantic pigtoe is not documented and suitable habitat does not occur in the SHP project area.

Green Floater

The green floater is not currently listed under the ESA. It was petitioned for listing in April 2010. The FWS determined the petition had substantial information, and initiated a status review in September 2011. The FWS is scheduled to determine if the green floater warrants listing under the ESA on or before September 30, 2020. The FWS recommended addressing the green floater in this EIS because the species may be proposed for listing and/or listed during the life of the projects.

The habitat of the green floater is quiet eddies and pools of small- to medium-size streams that have sand or gravel substrate. The species' reproductive season extends from August to May (NCWRC, 2016a).

According to FWS IPaC information, this species has the potential to occur in Bath, Nelson, Buckingham, Cumberland, Nottoway, Dinwiddie, Rockbridge, and Fluvanna Counties, Virginia, and in undetermined counties in North Carolina. In a letter to Atlantic from the VDGIF dated February 19, 2015, the VDGIF stated that the green floater has been documented in the James and Meherrin Rivers in Virginia (VDGIF, 2015a). Virginia WERMS data identified occurrences of green floaters within 2 miles of ACP in Brunswick, Greensville, Southampton, Buckingham, and Nelson Counties in the Meherrin River and James River.

The green floater is also known from the Greenbrier watershed, West Virginia, and may occur in the Swift Creek, Tar River drainages, Roanoke River, and has been documented in the Little River drainage (Neuse River basin) in North Carolina (NCWRC, 2016a; FWS, 2015f). North Carolina NHI data listed occurrences in Swift Creek within 2 miles of ACP in Nash County.

In 2015, Atlantic documented the dead shell of a green floater in one waterbody in Pocahontas County, West Virginia; however, Atlantic subsequently incorporated a route variation that eliminated this waterbody crossing. Presence is assumed in the James River, Mayo Creek, two unnamed tributaries to the James River, and Meherrin River (both crossings), Virginia; and the Roanoke River, Swift Creek, Tar River, and Neuse River, North Carolina. On ACP, final survey results for the green floater are expected in October 2017. Atlantic did not document the green floater in the SHP project area during surveys.

Freshwater Mussels Impact Assessment, Conservation Measures, and Determination

No ESA-listed or proposed mussel species nor the green floater (under review species) were identified at proposed waterbody crossings during 2015 and 2016 surveys. The Atlantic pigtoe, which is currently under review for listing by the FWS, was identified at two waterbodies in Virginia and four waterbodies in North Carolina.

In the June 16, 2017 Supplemental Filing provided by Atlantic and DETI, DETI indicates that clubshell does not need to be assumed present in the West Fork River, West Virginia, and therefore conservation measures for this species would not be implemented at this crossing location. We agree that clubshell mussel should not be assumed present at the West Fork River; however, based on consultation with the FWS and WVDNR, the snuffbox mussel should be assumed present, and therefore, in appendix K we continue to recommend the implementation of the FWS' enhanced conservation measures described in section 4.7.1 at the West Fork River.

Four out of six of these waterbodies where Atlantic pigtoe mussels were documented would be crossed utilizing the HDD method. In addition, Atlantic would employ the HDD crossing method at James River, Mayo Creek (as part of the James River HDD), Nottoway River (AP-3 MP 32.6) in Virginia, and Roanoke River, Fishing Creek, Swift Creek, Tar River, Contentnea Creek, Little River, and Cape Fear River in North Carolina to minimize direct impacts on listed, proposed, and under review mussels with the potential to occur in these waterbodies. Mussels occurring in waterbodies crossed by HDD may be affected if there is an inadvertent release of drilling fluid in or near the waterbody. The drilling fluid may affect water quality at the point of the release, and subsequently, may affect mussels at the point of release or in nearby downstream areas.

We recommend in section 4.7.1.8 that a hydrofracture potential analysis be conducted for the Neuse River (AP-2 MP 98.5) due to the potential or confirmed presence of Atlantic sturgeon, Atlantic sturgeon proposed Critical Habitat, ESA under review species, and state-listed species; however, there is also the potential presence of ESA-listed, proposed, and/or under review mussel species at these waterbodies, which further supports our recommendation for HDDs at these crossing locations, if feasible.

In two remaining waterbodies were Atlantic pigtoe mussels were observed, and where other ESA-listed, proposed, or under review mussel species are assumed present, Atlantic proposes to use dry crossing methods (e.g., dam and pump, cofferdam). Atlantic may indirectly affect downstream mussel populations during construction through increased sedimentation, degraded water quality, and turbidity. Atlantic's construction activities may cause injury or mortality to individuals that occur at the crossing from trenching in the streambed. Increased sedimentation could smother or impair feeding of mussels downstream, and could also cause host fish for mussel glochidia to avoid the area during reproduction, decreasing chances for successful reproduction. High and sustained levels of increased sediment may cause permanent alterations in invertebrate community structures, including diversity, density, biomass, growth, rates or reproduction, and mortality. Impacts on freshwater mussel species resulting from increased sedimentation is species-specific; some species can compensate for increased sedimentation by increasing filtration rates. Many endangered freshwater mussel species have evolved in fast flowing streams with historically low levels of suspended sediment and may not be able to compensate for increased sedimentation, which may result in reduced feeding, growth, and reproduction rates (EPA, 2003). In-stream rock removal or blasting may also be required at these waterbody crossings. Atlantic would use blasting to remove rock in the trenchline. Rock removal may alter the streambed composition and hydrology at the crossing location.

Atlantic would implement mussel relocation efforts at waterbodies crossed by a dry crossing technique. Atlantic would not relocate ESA-listed species without prior authorization from the FWS and the appropriate state agency. Relocation would occur a maximum of 6 months prior to construction, and would be conducted within spring and autumn months when mussels are more likely near the substrate surface and conditions are typically more acceptable for mussel surveys. In Virginia, Atlantic would adhere to the *Freshwater Mussel Guidelines for Virginia* (FWS and VDGIF, 2015a). Atlantic would provide methods and locations for mussel relocations to the FWS for review and concurrence prior to relocation efforts in waterbodies where mussels under federal review may be present. Overall, these relocation efforts would minimize direct impacts. Atlantic and DETI would implement the *West Virginia Mussel Survey Protocol* (Clayton et al., 2016) in West Virginia, and Atlantic would implement its *Freshwater Mussel Relocation Plan for ACP in North Carolina.* Removal of mussels at the crossing prior to construction may cause stress, physical injury, or mortality to some individuals.

Atlantic has proposed use of existing access road 02-096 AR1 across Hacker's Creek where clubshell mussels are assumed present. In Virginia, proposed existing access road 36-078.AR1 crosses Mill Creek. Although mussels were not observed during surveys, Atlantic has assumed presence of the James spinymussel and Atlantic pigtoe at Mill Creek based on agency data. On SHP, DETI has proposed the use of an existing access road 31-102-AR01 across McElroy Creek where the snuffbox mussel is assumed present. Although many of these access roads are existing, it is anticipated that there would be in increase in heavy vehicular and construction equipment traffic during construction that could increase erosion and sedimentation runoff from proposed access roads. Accidental spills of fuel or other chemicals may occur at or near the waterbody crossing. If such a spill were to reach mussel bearing waters, it could harm mussels through exposure to chemical contaminants or petroleum products.

DETI proposes to withdraw water for hydrostatic testing from one waterbody with assumed presence of ESA-listed species: McElroy Creek (snuffbox) and Atlantic proposes to withdraw water from five waterbodies with assumed presence of ESA-listed or under review species: Jackson River (James spinymussel), James River (green floater), Appomattox River (Atlantic pigtoe), Tar River (Atlantic pigtoe), and Contentnea Creek (Atlantic pigtoe). During water withdrawal, intake pumps have the potential for entrainment or impingement of larvae, and could reduce water flow volumes and velocities in streams causing an increase in sedimentation, altering dissolved oxygen levels, and reducing water levels in waterbodies which could expose mussels to desiccation (FWS, 2016n). We recommend in section 4.7.1 that Atlantic limit water withdrawal to not exceed 10 percent of instantaneous flow to further reduce potential entrainment of aquatic species.

Atlantic has designed HDD crossings to minimize the potential of an inadvertent return and in the event of an inadvertent return, Atlantic would implement the measures outlined in its *HDD Plan* (see appendix H), which includes measures to contain, clean-up, and report any spill that may occur. These measures would minimize the potential for an inadvertent return and minimize impacts on freshwater mussel species, if present. At waterbody crossings where Atlantic would use an HDD, Atlantic would maintain riparian vegetation, thus minimizing the chance of off road and other recreational crossing of the stream from the maintained right-of-way. Atlantic may conduct minor hand clearing of vegetation at trenchless crossing methods to lay construction guidewires or to place pumps for water withdrawal activities. Atlantic would not use in-stream guide wires for HDDs at ESA sensitive waterbodies.

In the non-HDD waterbodies located where ESA-listed, proposed, or under review species are assumed present, and the two crossings where the Atlantic pigtoe was identified, Atlantic would install silt curtains or similar devices downstream of the crossing location prior to in-stream activities to minimize downstream siltation and turbidity. Atlantic and DETI would use silt curtains in streams with slow water velocity in which sediment could remain suspended. In high velocity streams, Atlantic and DETI would use BMPs to control siltation and turbidity, such as conducting work during low flow conditions, limiting the duration of in-stream activities, placement of spoils on the bank above the high water mark, proper sizing of pumps and flume pipe, and frequent inspections of construction materials forming the waterbody crossing. Atlantic and DETI would also implement erosion control measures, such as turbidity curtains, filter/dewatering bags, and sediment barriers depending on the site-specific conditions.

Atlantic would also adhere to the VDGIF TOYR identified in table 4.6.1-2 that apply to the Atlantic pigtoe, James spinymussel, yellow lance, and dwarf wedgemussel (see appendix K) for all non-HDD crossings in Virginia, except for Sturgeon Creek (Atlantic pigtoe). Atlantic has proposed conducting a flume crossing of Sturgeon Creek in July 2019 with an expected duration of 14 days. We recommend in section 4.7.4.2 that Atlantic consult with the VDGIF regarding this proposal to conduct in-stream activities during the VDGIF TOYR. Pending survey results, the VDGIF has also requested that Atlantic adhere to the VDGIF TOYR of May 15 through July 31 for the James spinymussel at Jackson River based on its adjacency to occupied subwatersheds (VDGIF, 2017a). Therefore, we have recommended in appendix K that Atlantic assume presence of the James spinymussel in Jackson River and apply the VDGIF TOYR in this waterbody, in addition to the FWS' enhanced conservation measures outlined in section 4.7.1. In addition, the VDGIF also recommended that Atlantic assume presence of the Atlantic pigtoe (Virginia state-threatened species) in the Meherrin River based on historic occurrence data. Atlantic has indicated, as shown in appendix K, that it would implement the VDGIF TOYR (May 15-July 31); however, we are recommending that the VDGIF TOYR be extended to the perennial and intermittent tributaries crossed by ACP within 1 river mile of the Meherrin River, consistent with the VDGIF recommendations as indicated in appendix K. No in-stream activities, including water withdrawals, would take place during the VDGIF TOYR for the applicable species.

In the June 16, 2017 Supplemental Filing from Atlantic and DETI, Atlantic indicated that because a decision for the listing of the green floater would not occur until 2020, conservation measures for this species where presence has been assumed would not apply. We agree that Atlantic would not need to implement the FWS' enhanced conservation measures described in section 4.7.1 at the waterbodies where this species has been assumed present; however, the green floater is listed as threatened in the Commonwealth of Virginia, therefore, the VDGIF TOYR for in-stream activities, including water withdrawal would still apply. Therefore, we continue to recommend in appendix K that Atlantic implement the VDGIF TOYR for green floater from April 15 to June 15 and August 15 to September 30 in all waterbodies where this species has been assumed present in Virginia, and intermittent and perennial tributaries within 1 river mile of these waterbodies. We have also recommended in section 2.4 that, in order to facilitate the agency's ability to identify and prioritize conflicts between avoidance and conservation measures, and to subsequently provide that information to Atlantic, DETI, and permitting agencies for incorporation into the construction plans, Atlantic and DETI provide environmental constraints maps illustrating the avoidance and minimization measures required by the resource agencies and committed to by Atlantic and DETI along the ACP and SHP routes.

To minimize potential impacts of water withdrawals on the green floater, Atlantic would continue to implement the following measures at the James River:

- use 1 mm or smaller screens to minimize impingement/entrainment of mussel host fish species and ESA-listed, proposed, and under review species;
- limit water withdrawal to not exceed 10 percent of instantaneous flow;
- ensure that intake velocity does not exceed 0.25 f/s; and

- use floating intake structures to avoid impacts on stream bed.

In addition to implementing the FERC *Plan* and *Procedures*, Atlantic and DETI would minimize erosion and sedimentation from the construction workspace and access roads by implementing the WVDEP's *Erosion and Sediment Control Best Management Practice Manual* (WVDEP, 2006a), the Virginia *Erosion and Sediment Control Handbook* (VDEQ, 1992), the Pennsylvania *Erosion and Sediment Pollution Control Program Manual* (PDEP, 2012), and the North Carolina *Erosion and Sediment Control Planning and Design Manual* (North Carolina Sedimentation Control Commission et al., 2013). Atlantic and DETI would construct their projects in accordance with state/commonwealth Construction Stormwater NPDES permits, which regulate the discharge of stormwater generated from construction activities. A condition of these permits would be to develop and implement a project-specific *SWPPP* or *Erosion and Sediment Control Plan*. The *SWPPP* must assess the project area and select appropriate erosion and sediment control BMPs. Once installed, BMPs must be periodically inspected and repaired per each State's/Commonwealth's requirements. Inspections are normally required until the project has reached final stabilization and all temporary erosion and sediment BMPs have been removed. Where required by the FERC *Plan* and *Procedures*, permanent erosion controls, such as slope breakers, would be installed to aid long-term stabilization along with the restored vegetation.

Atlantic and DETI have committed to a number of additional The FWS' enhanced conservation measures in section 4.7.1 that would be implemented at ESA sensitive waterbodies. Based on federal and state agency recommendations, we recommend in appendix K that these FWS' enhanced conservation measures also be implemented at perennial tributaries within 1 mile of ESA sensitive waterbodies where construction activities are also proposed.

If Atlantic documents ESA-listed, proposed, or under review mussels during surveys at proposed access road crossings, the access road would not be used if in-stream activities cannot be avoided. Atlantic and DETI would utilize erosion and sediment control BMPs on access roads identified in the field as having significant erosion potential within 0.25 mile of waterbodies with ESA-listed, proposed, or under review species. If an access road crosses a waterbody with potentially suitable habitat for ESA-listed mussels and the access road requires in-stream activities for improvements, Atlantic would conduct surveys prior to any project activities. If Atlantic and DETI document ESA-listed mussels in the waterbody, they would not use the access road unless in-stream activities could be avoided such as through use of an existing bridge. In addition, Atlantic would employ erosion control fabric on the bridge over Hacker's Creek to prevent sediment from entering the waterbody when construction vehicles use the bridge.

If populations of ESA-listed, proposed, or under review mussels are documented during ACP 2017 surveys, Atlantic would review the crossing to determine if a route adjustment or HDD crossing is feasible. If a route adjustment or HDD is not feasible, Atlantic and DETI would apply for a permit to relocate mussels prior to construction. If Atlantic identifies mussel species under federal review, Atlantic would implement the above-described conservation measures in coordination with the FWS and appropriate state agencies, including possible TOYR and relocations prior to construction.

ACP and SHP *may affect* the snuffbox due to assumed presence of the species in McElroy Creek and West Fork River, but is *not likely to adversely affect* this species due to erosion and sedimentation controls. ACP and SHP may affect and are *likely to adversely affect* the clubshell due to potential impacts from erosion and sedimentation associated with the proximity of the pipeline and access road to a known population in Hacker's Creek in Lewis County, West Virginia. Due to the cumulative effects of increased sedimentation related to ACP and ongoing stressors within Hacker's Creek, there is the potential that this population may become extirpated. This is the last remaining genetic material of clubshell in the Monongahela watershed. ACP *may affect but is not likely to adversely affect* the dwarf wedgemussel, James spinymussel, and Tar River spinymussel. ACP *may affect*, but is *not likely to jeopardize* the yellow lance. FERC and FWS will re-evaluate these determinations upon receipt of pending survey results and proposed conservation measures.

ESA determinations are not applicable for the Atlantic pigtoe and green floater species because these species are not yet listed or proposed under the ESA.

National Forest Systems Lands

No waterbodies were identified within the survey corridor in the MNF that could provide suitable habitat for ESA-listed, proposed, or under review freshwater mussel species. However, suitable habitat for the green floater mussel, a MNF RFSS, has the potential to occur within the Greenbrier watershed. Based on Atlantic's erosion and sedimentation analysis, ACP is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds, which include the construction workspace crossing the MNF. To minimize these potential impacts, Atlantic would complete construction activities as quickly as possible, and implement the sediment and erosion control measures outlined the *COM Plan* (appendix G), and the BE (see section 4.7.3).

Atlantic conducted surveys at 10 perennial stream crossings, including unnamed tributaries to Warwick Run, Calfpasture River, Jennings Branch, White Oak Draft, Cowpasture River, and Laurel Run, on the GWNF in 2016 and did not detect any James spinymussel, Atlantic pigtoe (GWNF RFSS), green floater (GWNF RFSS), or yellow lance (a GWNF RFSS) or suitable habitat for these species at the waterbody crossing locations. The nearest documented occurrences of the Atlantic pigtoe and green floater are outside of the FS analysis area for ACP; however, as noted above, the green floater has been documented in the upper James River subbasin. Based on Atlantic's erosion and sedimentation analysis, ACP is predicted to produce annual soil loss ranging from 2.98 to 4.26 tons/acre during the first year of construction (see table 4.6.5-1), which equates to approximately 300 to 400 percent above baseline erosion for the Bolar Run-Jackson River, Dry Run, Scotchtown Draft-Cowpasture River, and Lick Run-Stuart Run subwatersheds of the upper James River subbasin, which could result in increased sedimentation and turbidity and aquatic habitat degradation downstream where green floater mussel may be present. The yellow lance is known to occur in the Cowpasture River, and James spinymussel is known in the Fort Lewis area of the Cowpasture River where Atlantic has proposed an access road and less than 0.25 mile from the pipeline crossing. The yellow lance occurrence is located more than 1 mile from the ACP project area. The GWNF indicated in a letter dated August 28, 2016 that although James spinymussel and yellow lance were not detected during surveys, there is potential for these species downstream of the waterbody crossing locations. Impacts on mussels located downstream of waterbody crossing activities or access roads include temporary increases in sedimentation and turbidity, and degraded quality. Atlantic's erosion and sedimentation analysis indicates that annual soil loss is estimated to be 3.74 tons/acre during the first year (374 percent above baseline) along the construction workspace in the Scotchtown Draft-Cowpasture River subwatershed where these waterbodies are located.

To minimize downstream impacts, Atlantic would conclude construction activities as quickly as possible, and would implement the sediment and erosion control measures outlined in the FERC *Plan* and *Procedures* (see table 2.3.1-1), Atlantic's *COM Plan* (see appendix G), and Atlantic's BE (see section 4.7.3). The *COM Plan* and the BE are still in draft form, and a number of conservation measures have not been finalized. Atlantic would also commit to the yellow lance and James spinymussel Virginia TOYR of May 15 to July 31 for all in-stream activities within the Cowpasture River and its perennial and intermittent unnamed tributaries within 1 river mile of the designated waterbody (see appendix K). Furthermore, where these species are assumed present as described in the sections above and in appendix K, we have recommended that Atlantic implement the FWS' enhanced conservation measures at ESA sensitive waterbodies as defined in section 4.7.1. Final surveys for mussels are pending and are anticipated in summer 2017.

4.7.1.16 Rusty Patched Bumble Bee

The rusty patched bumble bee (*Bombus affinis*) was listed as endangered by the FWS on March 21, 2017 (FWS 2017b). Historically, the rusty patched bumble bee was abundant and could be found broadly distributed across the eastern United States and Upper Midwest, from Maine south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Its range included 28 states, the District of Columbia, and 2 provinces in Canada (i.e., southern Quebec and Ontario). Since 2007, however, the species' distribution across the U.S. has declined greatly; current records are from only 9 U.S. states and 49 counties. The current range is understood to be limited to Iowa, Illinois, Indiana, Maine, Massachusetts, Minnesota, Ohio, Virginia, and Wisconsin (FWS, 2017b; 2017c).

The rusty patched bumble bee is a highly social species that forms annual colonies. These are established by solitary queens that emerge from hibernation or diapause in early spring (typically in April) and begin searching for suitable nest sites and foraging on early season plants (FWS, 2017b; 2016i). Upon establishment of a nest, the queen will begin laying eggs; the workers that hatch become responsible for foraging as the colony grows. The queen will remain at the nest and continue producing eggs. In late summer and early fall, the new queens and males hatch, and typically disperse approximately 1 kilometer to mate (FWS, 2016i). In late fall (typically in October), the old queen, workers, and males die, while the new queens enter diapause underground until spring emergence (FWS, 2016i).

The rusty patched bumble bee can be found in grasslands, prairie, marshes, agricultural areas, woodlands, and residential parks and gardens. The species forages on flowering forbs that provide nectar and pollen for food. Nesting sites are most often underground in abandoned rodent burrows or other cavities, typically 1 to 4 feet beneath the surface (Plath, 1922; FWS, 2016i), but the species may also utilize clumps of grass above ground (Plath, 1922; Goulson et al., 2015; FWS, 2016k, 2016j). Suitable habitat must also provide overwintering sites for hibernating queens (FWS, 2016i).

On ACP in Virginia, the species has historical occurrences in Nelson County, and both ACP and SHP pass through the species historic range (FWS 2017c; 2017d). The FWS has identified "high potential zones" around current (2007-2016) records where the species is most likely to be present (FWS 2017c); however, neither ACP nor SHP intersect a high potential zone.

Construction activities associated with ACP and SHP are not expected to impact individual rusty patched bumble bees. No current records for the species are found within the ACP and SHP project areas.

Construction of ACP and SHP would temporarily impact pollinator habitat (including forests, scrub-shrub, grasslands/herbaceous, barren land, woody wetlands, and emergent wetlands). The temporary loss of this amount of habitat would not significantly affect the overall availability of suitable habitat and would not result in a detectable or measurable impact on an individual's ability to find roosting, foraging, or breeding habitat. Atlantic would implement voluntary conservation measures for the species including avoiding aerial or broadcast pesticide and herbicide application. If these products must be used for treatment of invasive and noxious weeds, Atlantic would utilize targeted spot-spraying or wiping, or mechanical pulling as outlined in Atlantic's and DETI's *Invasive Plant Species Management Plan* (see table 2.3.1-1). Additionally, measures such as seeding disturbed areas with native plant species that are beneficial to pollinators, including aster and goldenrod species, could be used. Atlantic's and DETI's *Restoration and Rehabilitation Plan* (see appendix F) outlines the seed mixes and restoration practices that would be used along the pipeline route; some seed mixes would incorporate regionally specific and native forb (flowering plant) mixes in its traditionally all-grass seed mixes to provide food and habitat for pollinators and local wildlife species. Once revegetated, the restored workspace and permanent rights-of-way would provide pollinator habitat after the first or second growing season, and may naturally improve pollinator habitat along the project areas. Atlantic continues to coordinate with the appropriate agencies to identify seed mixes and practices and will provide a revised plan. In addition, Atlantic has voluntarily committed to maintaining a minimum mower blade height of 10 inches during maintenance of the permanent right-of-way during operations in Highland, Bath, Augusta, and Nelson Counties to minimize impacts on rusty patched bumble bee habitat.

Due to the temporary impact on pollinator habitat (see section 4.5.1.5) and the overall availability of suitable habitat surrounding ACP, the temporary and insignificant impact on foraging individuals, and the extremely low likelihood of a colony or hibernating queen occurring in ACP and SHP project areas, Atlantic and DETI *may affect* the rusty patched bumble bee; but is *not likely to adversely affect* this species. Atlantic's and DETI's measures outlined in the *Restoration and Rehabilitation Plan* (see appendix F), *Invasive Plant Species Management Plan* (see table 2.3.1-1), and other restoration and conservation measures would prevent adverse impacts to the population.

National Forest Systems Lands

Although there is suitable habitat for this species within the MNF and GWNF, and there are historical occurrences of this species in Nelson County where the GWNF is located, ACP does not cross the FWS "high potential zones" for this species within either the MNF or GWNF. Voluntary conservation measures as outlined above would provide beneficial habitat for the rusty patched bumble bee and other pollinator species along the rights-of-way in both the MNF and GWNF.

4.7.1.17 Plants

Twelve ESA-listed plant species may occur in the ACP project area in West Virginia, Virginia, and North Carolina: shale barren rock cress, Virginia sneezeweed, swamp pink, small whorled pogonia, pondberry, rough-leaved loosestrife, eastern prairie fringed orchid, Michaux's Sumac, northeastern bulrush, American chaffseed, running buffalo clover, and Virginia spiraea.

Atlantic developed state-specific survey plans for each state and commonwealth along the ACP route using NHI and guidance from the FWS and state natural resources agencies to target counties in which each species may occur. Atlantic evaluated the potential for suitable habitat in the ACP project area through desktop and field-based habitat assessments and subsequently conducted surveys for occupancy in areas of suitable habitat. They conducted the surveys for occupancy within the appropriate survey windows for each species, such as the period when the species were in bloom, and according to FWS-approved study plans. Surveys for federal- and state-protected plant species are still needed on approximately 563.3 acres of the ACP route and 47.1 acres of the SHP route in West Virginia; 572.9 acres on ACP in Virginia, and 74.5 acres on ACP in North Carolina. No surveys were required in Pennsylvania for SHP. Surveys are complete for the eastern prairie fringed orchid and for the American chaffseed in Virginia (some surveys remain in North Carolina for this species).

Shale Barren Rock Cress

Shale barren rock cress is a federally endangered biennial plant with no designated critical habitat. When the species' recovery plan was published, the FWS was aware of 34 extant populations and 1 historical population; 19 of the extant populations occurred within the MNF and GWNF. Because of the low numbers of individuals in most populations, the species is particularly at risk of local extirpation (FWS, 1991a).

Shale barren rock cress is endemic to Mid-Appalachian shale barrens of the Ridge and Valley Province of the Appalachian Mountains. Habitat indicative of the Mid-Appalachian shale barren is a shale slope with open, shrub-scrub vegetation of oak, red cedar, pine and other woody species that are adapted to xeric conditions (FWS, 1991a). FWS IPaC information indicate this species has the potential to occur in Pocahontas County, West Virginia and Highland, Bath, Augusta, and Rockbridge Counties, Virginia. Virginia NHI data identified occurrences within 2 miles of ACP in Augusta and Bath Counties. For more information on the shale barren rock cress' natural history, distribution, and threats, refer to the FWS' recovery plan for the species (FWS, 1991a).

In 2015, Atlantic conducted a habitat assessment for shale barren rock cress with follow-up surveys for individuals during the growing season in 2015 and 2016 in areas of suitable habitat in Virginia, including the GWNF (see below). Atlantic did not document shale barren rock cress individuals during these surveys. On ACP, final survey results for the shale barren rock cress are pending 2017 surveys.

Virginia Sneezeweed

Virginia sneezeweed is a federally threatened perennial wildflower with no designated critical habitat. The Virginia sneezeweed occurs in the state of Virginia in the Shenandoah Valley along the western boundary of the Blue Ridge Mountains (FWS, 2010b). The species' habitat is wetlands along the shorelines of shallow limestone ponds that are flooded seasonally (FWS, 2010b). According to FWS IPaC information, this species has the potential to occur in Augusta and Rockbridge Counties, Virginia. Virginia NHI data listed occurrences of Virginia sneezeweed within 2 miles of ACP in Augusta County. The FWS has not finalized a recovery plan or 5-year status review for the Virginia sneezeweed.

In 2015 and 2016, Atlantic conducted a habitat assessment for Virginia sneezeweed with follow-up surveys for individuals in areas of suitable habitat during the growing season. Atlantic documented one population of sneezeweed in Augusta County, Virginia within the Lyndhurst Conservation Site, which is no longer crossed by the route. On ACP, final survey results for Virginia sneezeweed are pending 2017 surveys.

Swamp Pink

Swamp pink is a federally threatened herb in the lily family with no designated critical habitat. This species has been documented in 7 states, including North Carolina and Virginia; the number of known populations has increased from 123 in 1991 to over 250 in 2011 (FWS, 2014d). Swamp pink occurs in a range of wetland habitats, including wet meadows, mountain bogs, swampy forested wetlands, and spring seepage areas (FWS, 2011b). According to FWS IPaC data, this species has the potential to occur in Augusta, Nelson, and Rockbridge Counties, Virginia. Virginia NHI data listed occurrences within 2 miles of ACP in Augusta County. For more information on the swamp pink's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2014d).

In 2015 and 2016, Atlantic conducted a habitat assessment and follow-up surveys for swamp pink individuals in areas of suitable habitat. Atlantic did not document any swamp pink. On ACP, final survey results for swamp pink are pending 2017 surveys.

Rough-leaved Loosestrife

Rough-leaved loosestrife is a federally endangered perennial herb with no designated critical habitat. Rough-leaved loosestrife typically is found on the edges of or ecotones between pond pine pocosins and longleaf pine uplands on saturated sandy soils or on shallow layers of organic soils over sand. The species may also occur in low shrub communities of Carolina bays in deep peat soils. The habitats where the species lives are maintained by fire or other types of disturbance such as mowing (FWS, 2011c). Rough-leaved loosestrife generally has low seed production and low genetic diversity due in part to self-incompatible flowers, few pollinators, and a small percentage of flowering individuals each year (FWS, 2014e).

The species is native to the sandhills and coastal plain of North Carolina and South Carolina. Extant populations are known from 12 counties in North Carolina and 1 site in South Carolina. Most of the species' populations have a small number of stems and are restricted in area (FWS, 2011c). According to FWS IPaC data, this species has the potential to occur in Cumberland, Harnett, and Scotland Counties, North Carolina. For more information on the rough-leaved loosestrife's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2014e).

In 2015 and 2016, Atlantic conducted desktop and field-based habitat assessments and subsequent surveys for individuals in areas of suitable habitat along the proposed ACP route in Cumberland County, North Carolina. Atlantic did not document any rough-leaved loosestrife individuals during surveys along the AP-2 mainline route. On ACP, for the remaining areas of suitable habitat found in the project area, final survey results for rough-leaved loosestrife are pending 2017 surveys.

Small Whorled Pogonia

Small whorled pogonia is a federally threatened species of orchid with no designated critical habitat. This species is widely distributed, but rare throughout its range (FWS, 2016k). The number of known populations of the species has increased from 33 in 1985 to 201 in 2014, although less than 40 of these 201 populations are estimated to be of good viability and integrity (FWS, 2008d; NatureServe, 2015). The habitat of the small whorled pogonia is mature forest stands with open understories comprised of birch, beech, oak, maple, hickory, and less commonly, conifers. The species typically occurs in acidic soils with a substantial leaf layer on the sloping banks near streams. Populations are usually small (less than 20 plants) (FWS, 2016k). According to FWS IPaC data, this species has the potential to occur in Pocahontas and Randolph Counties, West Virginia and Highland, Nelson, and Buckingham Counties, Virginia. For more information on the small whorled pogonia's natural history, distribution, and threats, refer to NatureServe's profile for the species (NatureServe, 2015).

Atlantic conducted habitat assessment for small whorled pogonia with follow-up surveys for individuals in areas of suitable habitat in 2015 and 2016. Atlantic documented four populations of small whorled pogonia in 2016:

- two adjacent to the survey corridor within the MNF West Virginia
- one within the survey corridor in the Seneca State Forest, West Virginia; and
- one adjacent to the survey corridor within the GWNF in Virginia.

The occurrence in the GWNF was the first documentation of small whorled pogonia in Highland County, Virginia. On ACP, final survey results for small whorled pogonia are pending 2017 surveys.

Pondberry

Pondberry is a federally endangered deciduous shrub with no designated critical habitat. Pondberry typically occurs in seasonally flooded wetland habitats such as bottomland hardwood forests in the interior of the country and the edges of isolated ponds, sinks, and other depressions in coastal areas. Although the species more typically occurs in the shade, it has also been documented in full sun. Pondberry is clonal. Populations are represented by clones (ramets) and genetically different individuals (genets). Pondberry populations have low genetic diversity due in part from the species' rarity, limited range, and infrequent sexual reproduction (FWS, 2011d; 2014f).

At the time of the species' listing in 1986, the FWS estimated that the species had 12 known populations. By 2011, the FWS was aware of 61 pondberry populations in Alabama (1), Arkansas/Missouri (17), Georgia (13), Mississippi (16), North Carolina (2), and South Carolina (12) due to the discovery of additional populations (FWS, 2014f). According to FWS IPaC information, pondberry has the potential to occur in Sampson and Cumberland Counties, North Carolina. For more information on the pondberry's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2014f).

In 2015 and 2016, Atlantic conducted desktop and field-based habitat assessments for pondberry suitable habitat (wetland sites in depressions) along ACP in Cumberland and Sampson Counties, North Carolina. Atlantic conducted subsequent surveys for individuals during the 2015 and 2016 growing season in areas of suitable habitat. Atlantic did not document any pondberry individuals. On ACP, final survey results for pondberry are pending 2017 surveys.

Eastern Prairie Fringed Orchid

Eastern prairie fringed orchid is a federally threatened perennial herb with no designated critical habitat. Eastern prairie fringed orchid has been documented in a variety of habitats, including mesic prairies, old fields, roadside ditches, and wetland habitats. The species requires full sun for optimum flowering and growth and open habitats with limited woody encroachment. The species also requires a symbiotic relationship with soil fungi called mycorrhizae for seedlings to become established; mycorrhizae facilitate the seeds' assimilation of soil nutrients (FWS, 2005b).

The species has declined more than 70 percent from original records in the United States (FWS, 1999). In 2013, the species was known from less than 60 sites in Virginia, Ohio, Michigan, Maine, Iowa, Illinois, Wisconsin, and Ontario (FWS, 2003). The eastern prairie fringed orchid's decline was related to habitat loss, primarily resulting from the conversion of habitat to agricultural lands (FWS, 2005b). Eastern prairie fringed orchid has the potential to occur in Augusta County, Virginia according to FWS IPaC information. For more information on the eastern prairie fringed orchid's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2010c).

Atlantic conducted desktop and field-based habitat assessments for the eastern prairie fringed orchid along the proposed ACP route in Augusta County, Virginia, and subsequent surveys for individuals when the species was in flower (June 15 to July 15). Atlantic did not document any eastern prairie fringed orchid individuals along the ACP (AP-1) mainline route in 2015 or 2016. Surveys are complete for this species.

Michaux's Sumac

Michaux's sumac is a federally endangered shrub with no designated critical habitat. The species typically occurs on sandy or sandy loam soils in open forested habitats with regular disturbance. Disturbance may be related to transportation corridors, rights-of-way, wind throws, or fire (FWS, 2014g). The species is also vulnerable due to low reproductive potential; a low proportion of the species' populations have both female and male plants (FWS, 2011e).

Michaux's sumac is endemic to the piedmont and coastal plain of North Carolina, Virginia, South Carolina, Florida, and Georgia (FWS, 2011e). The number of populations in Georgia, North Carolina, and Virginia increased from 16 in 1989 when the species was listed to 43 in 2014 (FWS, 2014g). Populations of the species have been destroyed and continue to be threatened by habitat degradation and loss due to industrial, commercial, and residential development. Michaux's sumac has the potential to occur along ACP in Nottoway, Dinwiddie, and Brunswick Counties, Virginia and Nash, Wilson, Johnson, Cumberland, Robeson, and Scotland Counties, North Carolina based on FWS IPaC information. Virginia NHI identified occurrences near Fort Pickett within 2 miles of ACP in Nottoway and Brunswick Counties. North Carolina NHI data listed occurrences within 2 miles of ACP in Wilson and Robeson Counties. For more information on the Michaux's sumac's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2014g).

Atlantic conducted desktop and field-based habitat assessment for Michaux's sumac and follow-up surveys for individuals in areas of suitable habitat during the species' flowering or fruiting season in 2015 and 2016. Atlantic documented one population of Michaux's sumac along the AP-1 mainline route in Robeson County, North Carolina. Surveys for Michaux's sumac are complete.

Northeastern Bulrush

Northeastern bulrush is a federally threatened sedge with no designated critical habitat. Similar to other sedges, northeastern bulrush lives in wet habitats, including small wetlands, sinkhole ponds, or wet swales, with water levels that fluctuate seasonally. Individuals may occur by the edge of the water, within water of varying depths, and where there is no water (FWS, 2008e). Northeastern bulrush is difficult to find and to recognize (FWS, 2006b). It requires ample sunlight for growth and reproduction (FWS, 1993). The northeastern bulrush is considered a relict species that was formerly more widespread (FWS, 2006b). According to FWS IPaC data, northeastern bulrush has the potential to occur in Pocahontas County, West Virginia and Highland, Bath, Augusta, and Rockbridge Counties, Virginia. For more information on the northeastern bulrush's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2008e).

Atlantic conducted desktop and field-based habitat assessments for the northeastern bulrush along the proposed ACP route in Augusta County, Virginia, and subsequent surveys for individuals during the growing season. Atlantic did not document any northeastern bulrush individuals along the AP-1 mainline route in 2015 or 2016. On ACP, final survey results for northeastern bulrush are pending 2017 surveys.

American Chaffseed

American chaffseed is a federally endangered perennial herb with no designated critical habitat. American chaffseed typically is found in soils that are acidic, sandy (such as sandy peat and sandy loam), and moist to dry through the year. American chaffseed occurs in open habitats including fire-maintained savannas, moist pine flatwoods, grass-sedge areas, and ecotonal regions between xeric sandy and peaty wetlands soils (FWS, 1991b). One of the species' primary biological constraints is dependency on habitat disturbance or management such as fire, fluctuating water tables, or mowing to maintain open to partly open habitats (FWS, 2011f).

At the time of listing in 1992, the FWS had documented 19 occurrences. By 1995, the FWS was aware of 72 occurrences of this species in North Carolina, South Carolina, New Jersey, Florida, and Georgia. This increase was due to the extensive searches for the species in North and South Carolina (FWS, 1995). Although American chaffseed was never common, population numbers have apparently decreased and the species' range has contracted in the past few decades (FWS, 2011f). American chaffseed has the potential to occur in Cumberland and Scotland Counties, North Carolina according to FWS IPaC information. For more information on the American chaffseed's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2011f).

Atlantic conducted a desktop analysis of the species' suitable habitat in Greensville County, Virginia and Cumberland County, North Carolina that focused on identification of soil mapping units with suitable sandy soils. Atlantic conducted field-based habitat assessments for the species and surveys for individuals in areas identified as suitable habitat during the 2015 and 2016 growing season. Atlantic did not document any American chaffseed individuals during these surveys. Final survey results for American chaffseed are completed in Virginia, and are pending 2017 surveys in North Carolina.

Running Buffalo Clover

Running buffalo clover is a federally endangered perennial herb with no designated critical habitat. In the FWS' most recent 5-year review for the species, the agency recommended that the species be downlisted to threatened (FWS, 2011g). The species lives in mesic habitats with filtered or partial sunlight in areas where there is moderate periodic disturbance from trampling, grazing, or mowing. Running buffalo clover populations are typically found in areas underlain by bedrock comprised of limestone or other calcareous rock (FWS, 2007d).

Running buffalo clover occurs in Ohio, Missouri, Indiana, West Virginia, and Kentucky. The species is extirpated from Kansas, Illinois, and Arkansas. Running buffalo clover is threatened by changes in patterns of habitat disturbance that lead to forest succession and canopy closure; as its name suggests, the species was historically dependent on habitat disturbance and seed dispersal from bison herds (FWS, 2007d, 2015k). According to FWS IPaC data, this species has the potential to occur in Randolph and Pocahontas Counties, West Virginia. For more information on the running buffalo clover's natural history, distribution, and threats, refer to the FWS' 5-year review for the species (FWS, 2011g).

Atlantic conducted a desktop and field-based habitat assessment for running buffalo clover in areas near or surrounded by geological types of the Mississippian Age where the species is typically found focusing on disturbed areas. Atlantic conducted follow-up survey for individuals during the 2015 and 2016 growing seasons. In 2016, Atlantic documented multiple occurrences of running buffalo clover within the study corridor in Pocahontas and Randolph Counties, West Virginia, totaling 5.1 acres. Atlantic avoided 1.0 acre of running buffalo occurrences through a route shift; 0.8 acre remain within the construction workspace or access roads. One of the occurrences was located on MNF lands (31 rooted crowns) and the remainder were located on private lands. Three of the major populations are as follows:

- 3,000 rooted crowns;
- 10,000 rooted crowns; and
- 15,000 rooted crowns.

Most occurrences were documented in areas with intermittent soil disturbance, such as former skid roads and pasture, under primarily closed-canopy mixed-hardwood forests with filtered light or small gaps in the canopy for light to penetrate. On ACP, final survey results for running buffalo clover are pending 2017 surveys.

Virginia Spiraea

Virginia spiraea is federally endangered perennial shrub with no designated critical habitat. Virginia spiraea occurs in southern Appalachia; isolated populations have been documented in mountainous areas of North Carolina, Georgia, Kentucky, Tennessee, Ohio, Virginia, and West Virginia. The species occurs along the banks of streams and rivers. It is dependent on periodic disturbances that may result from scouring floods to reduce competition from other woody vegetation (FWS, 2011h). According to FWS IPaC information, this species has the potential to occur in Randolph and Pocahontas Counties, West Virginia. West Virginia NHI data identified an occurrence of this species within 2 miles of ACP in Uphsur

County. The FWS has not published a recovery plan or conducted a 5-year status review for the Virginia spiraea.

Atlantic conducted a habitat assessment and follow-up surveys for individuals in areas of suitable habitat during the growing season in 2015 and 2016. Atlantic did not document any Virginia spiraea individuals along ACP. On ACP, final survey results for Virginia spiraea are pending 2017 surveys.

Plants Impact Assessment, Conservation Measures, and Determinations

Pending implementation of the conservation measures described below, Atlantic ground-disturbing activities would result in take of individual ESA-listed plants through mortality or injury within the ACP workspace or access roads. Atlantic would also potentially injure the plants during construction activities if dust, dirt, or construction debris settle on ESA-listed plants that are adjacent or near the construction workspace or access roads. Atlantic's maintenance of the permanent right-of-way would also potentially affect the microclimate and habitat of ESA-listed plants after construction is complete.

Atlantic may indirectly affect the suitable habitat of ESA-listed plants adjacent to or near the ACP project area if the sun exposure, hydrology, or soil composition and moisture are changed due to vegetation clearing and contouring. In addition, Atlantic may also indirectly affect ESA-listed plants through the introduction and spread of invasive species. These changes in sun exposure, hydrology, soil composition and content, and invasive species may potentially render the habitat as no longer suitable for these species.

During 2016 surveys, Atlantic documented multiple populations of running buffalo clover. Atlantic further delineated the larger populations of running buffalo clover to determine the extent of their boundaries. Based on this field assessment and current proposed workspace, Atlantic has the potential to directly impact about 16 percent of the running buffalo clover population that was documented in the area. Atlantic shifted the route to avoid 1.0 acre of running buffalo clover; however, 0.8 acre are still located within construction workspace and access roads.

In coordination with the FWS, Atlantic is securing a 500-acre mitigation site in Pocahontas County, West Virginia with about 50,000 stems of running buffalo clover. Pending concurrence from the FWS, this site would be monitored and managed for 5 years to enhance the viability of the running buffalo clover population; the site will be protected in perpetuity from development.

During 2016 surveys, Atlantic also documented four populations of small whorled pogonia: two adjacent to the survey corridor within the MNF in West Virginia; one within the survey corridor in the Seneca State Forest, West Virginia; and one adjacent to the survey corridor within the GWNF in Virginia. Atlantic is evaluating potential indirect impacts on these four small whorled pogonia populations. Atlantic does not expect the population in Seneca State Forest to be directly impacted because it is outside of the construction footprint; however, due to its occurrence adjacent to construction activities, it could be indirectly impacted by changes in light regime.

Atlantic has conducted a microclimate analysis of the four populations of the small whorled pogonia. These microclimate analyses included considerations of potential light, wind, surface water, and groundwater impacts from the project activities on the known populations. Based on their review of the microclimate analyses, the FWS recommends that Atlantic further quantify the impacts of the three small whorled pogonia populations on the MNF and GWNF per the FWS comments on the January 27, 2017 version of the Applicant-Prepared draft BA (comments on small whorled pogonia evaluation report) submitted to Atlantic and DETI on March 28, 2017. Atlantic is currently working with the FWS and FS to address their comments on the small whorled pogonia microclimate analysis and to finalize the conservation measures for this species.

Atlantic would implement the following conservation measures for the known populations of running buffalo clover and small whorled pogonia that Atlantic identified within the study corridor:

- Atlantic would employ a qualified biologist on NFS lands to document populations during the growing season the year prior to construction (2017), during construction, and the year following initial restoration activities near these sites. Atlantic would provide reports with photographs, a description of current habitat conditions, and stem counts to the FWS both after construction and after initial restoration activities at the sites previously identified;
- Atlantic would employ additional site-specific erosion control measures at the edges of the construction right-of-way and access roads to minimize the risk of sediments moving off the right-of-way. Atlantic would also place signage at the edge of the construction right-of-way to notify construction personnel of an environmentally sensitive area;
- Atlantic would use weed-free seed mixes for restoration; and
- Atlantic would implement its *Invasive Plant Species Management Plan* (see table 2.3.1-1) to further minimize any potential impacts on ESA-listed plant species. Spraying for invasive species would not take place within 25 feet of ESA-listed species, unless approved by the FWS and FS.

Surveys for ESA-listed plant species are still needed on approximately 9 percent of the ACP route and 68 percent of the SHP route in West Virginia, 15 percent on ACP in Virginia, and 3 percent remains on ACP in North Carolina. No surveys were required in Pennsylvania for SHP. Surveys are complete for the eastern prairie fringed orchid and for the American chaffseed in Virginia (some surveys remain in North Carolina for this species).

As the route has been adjusted, Atlantic and DETI has also adjusted the survey corridor to incorporate a 150-foot buffer on the revised pipeline centerline and a 25-foot buffer on proposed access road centerline, per the protocols developed with the FWS and other appropriate federal and state agencies. In areas where additional surveys are needed, if ESA-listed plants are identified within the survey corridor, direct impacts on individual plants identified during survey would be avoided if possible. If they cannot be avoided, Atlantic and DETI would work with the FWS to determine appropriate minimization and/or mitigation measures. Atlantic and DETI would also consult with the FWS for ESA-listed plant species documented within the survey corridor adjacent to the workspace or access roads, to account for potential indirect impacts.

In 2015, Atlantic documented a population of Virginia sneezeweed in Augusta County, Virginia and a population of Michaux's sumac in Robeson County, North Carolina; both populations have been avoided by route adjustments and thus would not be impacted by ACP. No American chaffseed, eastern prairie fringed orchid, northeastern bulrush, pondberry, rough-leaved loosestrife, shale barren rockcress, swamp pink, or Virginia spiraea were documented during Atlantic's surveys in 2015 and 2016. Therefore, based on 2015 and 2016 surveys, ACP would have *no effect* on American chaffseed, eastern prairie fringed orchid, northeastern bulrush, Michaux's sumac, pondberry, rough-leaved loosestrife, shale barren rockcress, swamp pink, Virginia sneezeweed, and Virginia spiraea. FERC and FWS will re-evaluate this determination upon receipt of pending survey results and proposed conservation measures.

ACP *may affect* running buffalo clover, and due to potential removal of local populations of this species ACP is *likely to adversely* affect buffalo clover. ACP may affect small whorled pogonia, and due to the potential indirect impact from sedimentation on individuals adjacent to the workspace, is *likely to* *adversely affect* this species. The FERC and FWS will re-evaluate these determinations upon receipt of pending survey results and proposed conservation measures.

National Forest System Lands

Appropriately timed surveys have not identified Virginia spiraea within the survey corridor on the MNF; therefore, no impacts on this species are anticipated. In 2016, Atlantic documented one occurrence of running buffalo clover within the survey corridor on the MNF along an access road. In addition, Atlantic's 2016 surveys documented two occurrences of small whorled pogonia in the MNF adjacent to the survey corridor.

On July 28, 2016, Atlantic met with MNF, FWS, and West Virginia Division of Natural Heritage (WVDNH) at the MNF sites of occurrence of the running buffalo clover and small whorled pogonia. During the meeting, Atlantic and agency staff discussed potential impacts on the populations including sedimentation and erosion from the construction workspace, introduction of non-native species, and changes in moisture and light regimes; avoidance and minimization measures were also discussed. The MNF formally noted the need to develop avoidance measures in a comment letter filed on September 7, 2016.

For running buffalo clover on the MNF, agency staff recommended a minor shift of an access road to avoid direct impacts on and potential changes to the maintenance activities in the area. MNF requested that Atlantic develop a written proposal that outlines the avoidance and minimization measures that were discussed and submit to the agencies involved. Atlantic continues to work with the FS to develop this mitigation plan.

Atlantic has conducted a microclimate analysis of the three populations of the small whorled pogonia on the MNF and GWNF, based on consultation with the FS. Results of the microclimate analysis and subsequent conservation measures on the MNF and GWNF are provided below:

- The MNF population #1 would have a light regime change from removal of vegetation in the construction right-of-way, which could impact the microclimate around this population. Atlantic has shifted the workspace away from the population and to the opposite side of a ridge to reduce potential impacts resulting from a change in light regime and to reduce the risk of sediment reaching plants downslope.

- The MNF population #2 is over 300 feet from the construction workspace and due to terrain, the light regime would likely not change from removal of vegetation. Atlantic would implement diversion channels to divert water away from the plants during construction, minimizing erosion and sedimentation that could impact this population.

- The GWNF population may be impacted by a change in light regime resulting from removal of vegetation on the right-of-way, and may be impacted by an access road that has been proposed nearby. Atlantic would use diversion channels to divert water away from plants during construction.

The FS reviewed and commented on the microclimate analysis and the conservation measures proposed in the draft BA. The FS requested that the following issues be corrected:

- quantify the light regime in the microclimate analysis, rather than the qualitative visual assessment that was provided;

- provide a more fully developed, site-specific plan for controlling invasive species;
- lengthen the monitoring timeframe beyond the currently proposed 1 year of post-construction monitoring;
- address potential project impacts on the lateral flow of soil water, which may be important to the plants' survival; and
- around the route shift, conduct surveys to account for potential indirect impacts through changes in the light regime.

Pending the provision of this information, the FS has not concurred with Atlantic's determination that the National Forest populations of small whorled pogonia would not be adversely affected.

For the occurrences of small whorled pogonia on the MNF, Atlantic and agency staff discussed a minor route variation to increase the distance between construction and one of the populations, in addition to other avoidance and minimization measures. As a result, Atlantic shifted the route by the occurrence so that the occurrence is greater than 100 feet from the workspace; this route shift may minimize changes in the light regime and reduce the risk of impacts from erosion. Atlantic would attempt to minimize impacts from erosion and sedimentation on the other MNF occurrence by employing diversion channels to divert water from the population; this population would not likely be impacted by changes in light regime due to construction. A determination on the effectiveness of these measures awaits receipt of the outstanding information noted above. The MNF recommended that Atlantic provide a written proposal outlining avoidance and minimization measures that addresses the following concerns:

- demonstrate that runoff, sedimentation, slope failures, etc. from the disturbed area would not reach the populations. These measures should be site-specific (i.e., not a reference to the overall project sedimentation and erosion control plans);
- demonstrate, on a site-specific basis, that ACP would not change groundwater or surface water hydrology at the population sites;
- demonstrate that ACP would not appreciably change the light regime or moisture conditions at the population sites. These measures should address potential site-specific changes based on aspect, daily and annual patterns of insolation, penetration of sunlight and wind through the remaining tree canopy, and any other pertinent factors;
- demonstrate that ACP would not result in new or expanded infestations of non-native invasive species that could impact the small whorled pogonia populations. These measures should be site specific (i.e., not a reference to the overall project invasive species prevention plan);
- demonstrate that long-term operation and maintenance activities will not impact the populations;
- the new route variation must have the same level of environmental survey as the current proposed route;
- develop a plan to monitor contractors so that all conservation measures are implemented as planned; and

- develop a monitoring plan for plant and habitat conditions (including invasive species) around the populations pre- and post-construction.

Avoidance of adverse impacts is necessary for compliance with direction in the MNF LRMP.

Surveys have not identified the northeastern bulrush, shale barren rock cress, swamp pink, Virginia sneezeweed, or Virginia spiraea within the survey corridor on the GWNF; therefore, no impact on these species are anticipated. One population of small whorled pogonia was identified adjacent to the survey corridor in the GWNF. Atlantic is currently exploring avoidance and minimization measures for the populations of running buffalo clover and small whorled pogonia documented in 2016.

Although the occurrence of small whorled pogonia is not within the survey corridor, potential impacts on the individuals are possible due to sedimentation and erosion from the construction workspace, introduction of non-native species, changes in light regimes, increased deer browsing, and access roads. Atlantic met with the GWNF at the site of the occurrence to discuss potential impacts and mitigation on October 17, 2016. The occurrence on the GWNF may be affected by changes in light regimes and by erosion and sedimentation from the construction workspace. Atlantic would employ diversion channels to divert water from this occurrence of small whorled pogonia to minimize potential impacts from erosion and sedimentation. Atlantic continues to work with the FS to develop this mitigation plan.

4.7.2 Marine Mammal Protection Act Species

Atlantic and DETI, as the non-federal representatives to the FERC, conducted informal consultation with NMFS regarding marine mammals occurring near ACP and SHP that are protected under the MMPA of 1972. Two species of marine mammals may be present in the ACP project area in the Nansemond, James, and South Branch Elizabeth Rivers (crossed by the AP-3 lateral): bottlenose dolphin and harbor seal (NMFS, 2016c; 2016d; and 2016e). Given the lack of marine habitat, no species of marine mammals are present in the SHP project area.

Atlantic and DETI consulted with NMFS and determined that species-specific surveys were not required for MMPA species on the Nansemond and South Branch Elizabeth Rivers (Carduner, 2016; Goldstein, 2016). Instead, Atlantic and DETI used best available scientific information to identify areas in ACP and SHP areas where there the species may occur and consulted with NMFS about the likelihood of occurrence of marine mammals in ACP and SHP areas and the probability of harassment under the MMPA. As a result, we can draw adequate conclusions regarding species impacts.

4.7.2.1 Bottlenose Dolphin

Bottlenose dolphin populations occur in both temperate and tropical waters along coasts and offshore. Coastal populations may occur in river mouths, estuaries, and bays and typically occur in groups of 2 to 15 individuals. The species forage both as individuals and cooperatively in groups for fish using multiple hunting strategies. Threats to the species include incidental injury and mortality from fishing gear, exposure to pollutants and biotoxins, and viral outbreaks (NMFS, 2015c).

Stocks of the bottlenose dolphin that may occur in the ACP project area include the Western North Atlantic Southern Migratory Coastal and Northern North Carolina Estuarine System Stock. The populations sizes of the Western North Atlantic Southern Migratory Coastal Stock and Northern North Carolina Estuarine System Stock are 9,173 and 823 individuals, respectively; population trends for both stocks are unknown (NMFS, 2016c; 2016d).

4.7.2.2 Harbor Seal

Harbor seals occur in temperate coastal habitats from the Canadian Arctic occasionally as far south as North and South Carolina. Individuals may haul out on beaches, rocks, and reefs to rest, interact, give birth, and thermoregulate; they use similar habitats as pupping sites. The species gives birth during spring and summer. Their diet includes a variety of fish, crustaceans, and shellfish. Threats to the species include ship strikes, harassment, oil spills, and incidental capture in fishing gear (NMFS, 2015d).

Stocks of harbor seals generally appear to be either stable or increasing, except for the stock in the Gulf of Alaska. The Western North Atlantic Stock occur along eastern coast of the United States and in some tributaries to the Atlantic Ocean. NMFS estimates that the Western North Atlantic Stock is about 76,000 individuals, based on a 2012 survey. The population trend for this stock is unknown (NMFS, 2016e).

4.7.2.3 Marine Mammals Impact Assessment and Conservation Measures

There is a low likelihood that marine mammals would be present in the Nansemond, James, and South Branch Elizabeth Rivers where ACP crosses these waterbodies during the time of construction (NMFS, 2016f, 2016g). Atlantic would cross these waterbodies using the HDD method. NMFS indicated to Atlantic that ACP would have a very low probability of resulting in marine mammal harassment if Atlantic used the HDD method to cross the waterbodies (NMFS, 2016g). It is unlikely that noise from the drill activities would affect marine mammals if they were near the HDD due to the low probability that they would be present at the crossings. In addition, if disturbed by vibrations, the marine mammals could move away from the vibrations. Effects on marine mammals resulting from water withdrawals would also be unlikely because water intakes would be screened to avoid entrainment or impingement of aquatic species. No ACP access roads would cross the James, Nansemond, or South Branch Elizabeth Rivers.

Per guidance from NMFS, ACP would not result in harassment of marine mammals and thus would not require an Incidental Take Authorization or *Marine Mammal Monitoring Plan* under the MMPA. If ACP personnel observe marine mammals near the HDD site, Atlantic would report the observations to NMFS. If Atlantic cannot complete an HDD at these three waterbodies and the waterbody crossings would require in-stream work, Atlantic would re-consult with NMFS to evaluate the need for an Incidental Take Authorization.

4.7.3 Forest Service Managed Species

4.7.3.1 Regional Foresters' Sensitive Species

The FSM 2670 requires all Forests that are part of the NFS to maintain a list of plant and animal species for which population viability is a concern, evidenced by their significant current or predicted downward trends in population numbers, or density, or habitat capability that would reduce the species' existing distribution. These species are identified by the Regional Forester, and are therefore called the RFSS. Activities on NFS lands must be managed to ensure that current ESA-listed species do not become extirpated, and that activities do not result in ESA listing of RFSS, or loss of viability of RFSS within the NFS proclamation boundaries. Thus, there must be an analysis of the significance of adverse effects on the populations, its habitat, and on the variability of the species, which are documented in a BE.

Both the MNF and GWNF provided a full list of RFSS species with the potential to occur within those forests. There are 135 RFSS in the MNF and 141 RFSS in the GWNF. In consultation with the MNF and GWNF, Atlantic performed either desktop habitat assessments or on-the-ground field surveys to identify which of the RFSS and/or their suitable habitat have the potential to occur with the ACP project area. The species with the potential to be affected by ACP in the MNF are identified in table R-1 in appendix R, and in the GWNF in table R-2 in appendix R; species that would not be affected because the ACP project area is outside of their range and/or there is no suitable habitat for the species within the ACP project area are not discussed further in this section. Appendix R describes suitable habitat, presents results of desktop analysis and/or habitat assessments or individual surveys conducted within the ACP project area, provides preliminary effects determination (where available), and describes the conservation measures that Atlantic would implement to avoid or minimize impacts on RFSS. The information provided in appendix R is based upon survey reports and supplemental information received from Atlantic through June 2, 2017 the draft BE,[13] MIS Report, Locally Rare Species Report, and survey reports, where available. Full species accounts, description of habitat preferences, and a more detailed discussion of the potential impacts and conservation measures for each of the affected species would be provided in the draft BE. The BE will also include the full list of species evaluated, including those that were determined to not be affected. Impacts on vegetation communities and wildlife habitat found in the MNF and GWNF are described in section 4.4.6 and 4.5.9, respectively, and impacts on aquatic habitat found in the MNF and GWNF are described in section 4.6.5. The BE is still in draft form and some field surveys are yet to be completed. Surveys are ongoing and an effects determination for RFSS will be reflected in the FS' Final ROD.

4.7.3.2 Management Indicator Species

Each National Forest is required by the NFMA to identify MIS in their LRMP that represent fish and wildlife habitats to be maintained and improved. MIS consist of "plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (FSM, 2620.5).

There are 4 MIS in the MNF, and 14 MIS in the GWNF associated with a variety of habitat types. These MIS species, the MNF and GWNF desired conditions and/or objectives associated with each species, potential impacts resulting from construction and operation, conservation measures, and conclusion of effects are described in table R-3 in appendix R. The information provided in appendix R is based on supplemental information in the MIS Report filed by Atlantic on March 10, 2017.

4.7.3.3 Forest Service Locally Rare Species

The GWNF maintains a list of locally rare species, which are species that may be secure throughout their range, but are considered rare within the boundaries of the GWNF. The MNF does not maintain a locally rare species list. The GWNF manages and regulates locally rare species in its *LRMP*. The locally rare species that have the potential to occur within the ACP project area were determined through consultations with the GWNF, desktop analysis of suitable habitat, and field surveys. These species are described in table R-4 in appendix R, with the identification of the presence of suitable habitat or individuals within the ACP project area, potential impacts, and conservation measures that Atlantic would implement to avoid or minimize impacts on the locally rare species. The information provided in appendix R is based on supplemental information in the Local Rare Species Report filed by Atlantic on February 24, 2017.

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[13] The draft BE can be viewed on the FERC Internet website at http://www.ferc.gov. Using the eLibrary link, select "Advanced Search" from the eLibrary menu and enter 20170310-5157 in the "Accession Number" field. The direct links to the PDF files are: Part 1: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14515830 and Part 2: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14515831. The FS comments on the draft BE are available in the Federal Accession Number 20170501-5555. The direct link to the PDF file is: https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14569621.

4.7.3.4 Forest Service Managed Species Impact Assessments and Conservation Measures

The potential species-specific impacts that would be anticipated for the FS managed species and/or their suitable habitat that have the potential to occur in ACP project area are further described in appendix R and the draft BE.

To minimize impacts on these species, Atlantic would implement the *COM Plan* (see appendix G), which will describe the avoidance and minimization measures that would be implemented during construction and operation activities specifically on NFS lands. Atlantic has committed to the implementing the following conservation measures on NFS lands that are or will be further described in the *COM Plan* and BE. These measures may reduce potential impacts on certain FS-managed species to varying extents. However, these measures are not intended to achieve site-specific avoidance and minimization impacts of known species occurrences and habitat features that fall within or near the proposed construction footprint. Additional measures are needed to achieve required avoidance and minimization of such impacts and to be consistent with MNF LRMP Standard WF13 and VE13.

Atlantic would avoid clearing forested habitat occupied by Indiana bats (defined as a 5-mile radius from a mist net capture or known Indiana bat hibernacula) during the active season from April 1 to November 14 to avoid impacts on roosting or foraging bats, which may be beneficial to other species;

- tree clearing would be avoided during the migratory bird nesting season (see section 4.5.3), which could also be beneficial to other species;
- least-intrusive tree removal methods would be employed to reduce damage to adjacent forest habitat;
- large-diameter trees and snags would be retained at the periphery of the construction area, where possible, to further help reduce habitat impacts;
- felled woody debris would be retained along the edge of the right-of-way for wildlife habitat;
- to avoid species entrapment during construction phase, temporary soft plugs and ramps would be installed in the open trench to provide passage across or egress from the open trench. Atlantic's EIs would inspect the open trench daily, prior to construction activities, to identify and relocate animals (or livestock) that may have fallen into the trench. Atlantic would also place gaps in the temporary trench spoil piles and pipe stringing areas to allow wildlife movement through the construction corridor;
- construction across streams would be completed as quickly as possible;
- in-water work would adhere to seasonal restrictions where applicable, as specified in appendix K;
- dry stream crossing methods, including either the flume or dam-and-pump method, would be implemented for pipeline construction across waterbodies on NFS lands, which would help reduce the introduction of sediment and turbidity into potential aquatic species habitat during construction;

- all ATWS (such as staging areas) would be sited at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;

- sediment barriers would be installed along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;

- turbidity would be monitored at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

- remediation measures would be implemented should the chronic turbidity reading exceed standards;

- a clearly marked 100-foot-wide vegetation buffer would be maintained between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;

- adequate waterbody flow rates would be maintained to prevent the interruption of existing downstream uses;

- waterbody banks would be stabilized and temporary sediment barriers would be installed within 24 hours of completing in-stream construction activities;

- logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber would not be disturbed unless they prevent trenching or fluming operations or operation of equipment;

- any existing logs that are removed from waterbodies to construct the pipeline crossing would be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored;

- Atlantic would not use herbicides or pesticides in or within 100 feet of a wetland or waterbody, except as allowed by the FS;

- Atlantic would ensure cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off NFS lands), wash water containment/ filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials;

- herbicide and mechanical/hand pulling treatment methods for non-native invasive plants would be implemented in coordination with the FS, including site-specific treatment methods in areas where treatments may be restricted (e.g., difficult topography, saturated soils, etc.);

- non-native invasive plant infestations along the construction right-of-way would be monitored and treated for the life of pipeline operations;

- a non-native invasive plant density and cover would be maintained that does not exceed that found on nearby non-forested, undisturbed lands, with implementation of remedial actions where goal is not met;

- insecticides, herbicides, or refueling would be prohibited within 300 feet of karst features that would allow unfiltered and unimpeded flow of surface drainage into the subsurface environment;

- erosion and sediment controls would be used to minimize impacts on downslope karst features within 300 feet of the workspace;

- no activities would be allowed within 25 feet of karst features that would allow unfiltered and unimpeded flow of surface drainage into the subsurface environment except where that feature falls within 25 feet of the trenchline; the buffer would be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities;

- access road surfaces would be stabilized by grading and installing stone where needed;

- all perimeter BMPs would be installed immediately after any bulk earthmoving activity;

- temporary slope breakers, also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, would be installed as needed to reduce runoff velocity and divert water off the construction right-of-way;

- temporary sediment barriers would be removed from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- special procedures would be used for steep slope areas (e.g., the use of additional structural materials; steep slope construction method with reduced construction times; and targeted mitigation of seeps, springs, or other subsurface water encountered);

- site-specific and area-specific seed mixes, including native seed and local ecotypes, would be used where available, along with specific revegetation techniques in accordance with FS consultations;

- permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) would be implemented to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

- final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) would be completed generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

- all ATWS and the outermost portions of the construction right-of-way, including 20 feet on the working side and 13 feet on the spoil side, would be replanted with a combination of indigenous tree and shrub seedlings on NFS property. The mix of tree and shrub species would be determined in consultation with the MNF and GWNF;

- right-of-way edges would be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public;
- disturbed riparian areas would be revegetated with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands;
- Atlantic would implement restoration monitoring and maintenance (e.g., assessment of effectiveness of erosion control measures, assessment – through quantitative analysis of ground cover in monitoring plots – revegetation success for years 3 and 5, monitoring of vegetation for the life span of the pipeline operation); and
- Atlantic would implement restoration goal of reseeded/replanted species achieving equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met.

Additional avoidance and minimization measures beyond those identified above are described in Atlantic's *COM Plan* (appendix G) and the BE. In addition, the following ACP project-wide conservation plans and procedures would be applied on NFS lands, as applicable: *HDD Plan* (see appendix H), *Karst Mitigation Plan* (see appendix I), *Protected Snake Conservation Plan,* and *Migratory Bird Plan,* (see table 2.3.1-1). Species-specific conservation measures that would be implemented by Atlantic are described and categorized by species in appendix R.

The MNF and GWNF requested surveys on NFS lands for certain RFSS and GWNF locally rare species. The results of these surveys are described in appendix R. Table 4.7.3-1 identifies pending surveys on NFS lands and their anticipated completion date. As of November 2016, approximately 5 miles of the survey corridor on NFS lands have not been surveyed for biological resources (0.7 mile on MNF and 4.3 miles on GWNF). An undetermined number of access road improvement sites also remain to be surveyed.

TABLE 4.7.3-1

Pending Biological Surveys on the Monongahela National Forest and George Washington National Forest for Regional Foresters' Sensitive Species and Locally Rare Species along the Atlantic Coast Pipeline

National Forest	Species	Anticipated Completion Date
Monongahela National Forest	Bat Species	June 2017
	Multi-Botanical	September 2017
	Allegheny Woodrat	June 2017
	Timber Rattlesnake	June 2017
	Multi-Animal	Various
George Washington National Forest	Bat Species	June 2017
	Multi-Botanical	October 2017
	Small Mammals	June 2017
	Timber Rattlesnake	June 2017
	Multi-Animal	Various

As indicated above, the analysis provided in the draft BE submitted March 10, 2017 is incomplete. In addition, surveys are pending for GWNF locally rare species. An effects determination for RFSS and GWNF locally rare species will be reflected in the FS' Final ROD.

4.7.4 State-Sensitive Species

4.7.4.1 West Virginia

West Virginia does not have state threatened and endangered species legislation; however, it does assign State Ranks to rare species based on the species documented occurrences and distributions through the West Virginia Natural Heritage Program administered by the WVDNR. In addition, West Virginia revised its' *State Wildlife Action Plan* in June 2015, which provides an updated list of SGCN, included according to one or more of the following vulnerability criteria:

- globally ranked G1-G3 or threatened on the International Union for Conservation of Nature Red list;
- ESA-listed as threatened or endangered;
- regional SGCN;
- state ranked S1-S3;
- on WVDNR's tracked species list;
- disjunct or otherwise genetically unique populations; and
- state ranked S4 or S5 if:
  - listed by a regional or taxa working group as a species of concern;
  - recent threat or downward population trend; and
  - received a Climate Change Vulnerability Index (CCVI) score of extremely or highly vulnerable (1 or 2).

SGCN are then assigned Priority 1 or Priority 2 status based on an assessment of conservation urgency and opportunities for conservation action. Priority 1 species include all G1-G3 species, all S1 species, all species with CCVI score of 1 or 2, and all species that experts think should be priorities for conservation work in the next decade. This prioritization resulted in the identification of 319 Priority 1 species and 342 Priority 2 wildlife species. In addition, 121 Priority 1 plant species and 361 Priority 2 plant species were identified.

Species with the potential to occur in or near ACP and SHP were determined primarily through the review of the West Virginia Natural Heritage Program data, review of WVDNR Wildlife Diversity Program publications (WVDNR, 2003), NatureServe Explorer (NatureServe, 2015), information provided through informal consultation with the WVDNR, and 2015 and 2016 field surveys conducted by Atlantic and DETI. Each of these species, its potential occurrence and general habitat information, and potential ACP-related impacts and conservation measures are summarized in table S-1 in appendix S. The West Virginia SGCN that are also ESA-listed, proposed, or species under review for listing are discussed in more detail in section 4.7.1. Bald and golden eagles and other migratory birds are discussed in detail in section 4.5.3. SGCN that are also MNF RFSS or MIS species are indicated by footnotes in table S-1 in appendix S and are further discussed in section 4.7.3.

Table S-1 in appendix S describes the habitat where West Virginia SGCN are typically found. The WVDNR uses the Northeast Terrestrial Habitat Classification System (NETHCS), the Northeast Habitat Map (described further in section 4.4), and WVDNR data to map both terrestrial and aquatic wildlife habitat. Most impacts on SGCN are a function of the type of habitat disturbed (habitat association), the length of time necessary for important habitat characteristics to be restored, species mobility, species dependence on specific habitat features, or species disturbance tolerance. Only SGCN that have documented occurrences and potentially suitable habitat within ACP and SHP project areas have been included in table S-1 because there may be a direct impact on the species' forage species, and/or roosting/ breeding sites.

In addition to the species-specific mitigation measures described in table S-1 in appendix S, Atlantic and DETI have committed to certain measures for freshwater mussels and cave invertebrates, as described below.

The WVDNR requested that Atlantic and DETI conduct surveys for certain SGCN species. The results of these surveys are described in table S-1 of appendix S. As of May 2017, there are 866 acres of pending biological surveys in West Virginia on ACP, including surveys for bats, plants, and timber rattlesnakes. There are an additional 50.1 acres of pending biological surveys for plants and bats on SHP. Surveys are anticipated to be completed in 2017.

Freshwater Mussels

All mussel species are protected in the State of West Virginia under West Virginia §20-2-4 and CSR 58-60-5.11 by the WVDNR. If impacts cannot be avoided, all streams known to harbor mussels must be surveyed, and if mussels are present, they must be relocated prior to disturbance. Atlantic and DETI performed mussel surveys according to the *West Virginia Mussel Survey Protocol* (Clayton et al., 2016). Relocation efforts would also proceed according to these guidelines upon authorization from the WVDNR. The results of the 2015 and 2016 mussel surveys by species are documented in table S-1 in appendix S for all non-ESA-listed mussel species, and in appendix K. No additional mussel surveys are currently proposed in 2017 in West Virginia.

Per FWS and WVDNR correspondence, Atlantic assumes presence of freshwater mussel species at West Fork River, and Hacker's Creek crossed by ACP, and McElroy Creek and South Fork Fishing Creek crossed by SHP. Both McElroy Creek and Hacker's Creek are classified as endangered mussel streams. We have recommended in section 4.7.1 and appendix K that Atlantic and DETI implement the FWS' enhanced conservation measures at these waterbodies and their perennial tributaries within 1 mile of project activity. During 2015 and 2016 surveys, Atlantic and DETI observed creeper, fatmucket, Wabash pigtoe, plain pocketbook, fluted shell, three ridge, and spike mussels (dead shells or alive) at two waterbodies crossed by ACP, and at two crossing locations at two waterbodies crossed by SHP.

Bats

Surveys were conducted for ESA-listed bat species in West Virginia (see section 4.7.1). In addition, SGCN bat species were documented if incidentally detected or captured during mist-net surveys, including eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus lucifugus*), and tri-colored bat (*Perimyotis subflavus*). The results of these surveys are described in table S-1 in appendix S. There are 586 acres of hibernacula and roost tree surveys and 120 acoustic, mist-net, and Phase 1 hibernacula sites pending in West Virginia along ACP; and 3.0 acres of roost tree mapping and 4 acoustic and Phase 1 hibernacula sites pending on SHP. Surveys are anticipated to be completed in October 2017.

Snakes

Surveys were conducted for timber rattlesnakes in West Virginia, and the results of these surveys are described in table S-1 in appendix S. There are 0.2 acre of pending habitat and occupancy surveys, which are anticipated to be completed in May 2017.

Cave Invertebrates

There are several subterranean obligate species, including the Organ cavesnail (*Fontigens tartarea*), underground crayfish (*Cambarus nerterius*), and several species of isopods (*Caecidotea* spp.), amphipods (*Stygobromus* spp.), springtails (*Pseudosinella* spp. and *Sinella* spp.), millipedes (*Pseudotremia fulgida* and *Zygonopus weyeriensis*), flatworms (*Macrocotyla hoffmasteri*), and cave beetles (*Pseudanopthalmus* spp.) that have the potential to occur in the ACP project area. These species are highly specialized to caves or other subterranean habitats and are only known from a limited number of caves within the mountainous counties of West Virginia (see table S-1 in appendix S). These species are typically unable to survive outside of their subterranean habitat (WVDNR, 2015a).

The Final Karst Survey Report, described in section 4.1.2.3, identified karst features; however, due to the underground nature of these systems it is difficult to identify their full extent. Because no additional assessment was made of the karst features to determine whether they are appropriately suitable for any of the cave or subterranean obligate species (except bats), we assume that all karst features are suitable habitat for subterranean obligate species described in table S-1 of appendix S, and assume presence of these species. As discussed in section 4.1.2.3, the development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, as discussed in section 4.3.1.7, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's *Karst Mitigation Plan* (see appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts. The VDCR-DNH and the Virginia Cave Board have endorsed the revised *Karst Mitigation Plan* as comprehensive and indicate that the measures included would reduce the potential risk posed by ACP to karst resources.

Atlantic would perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way, as described in section 4.1.2.3.

Atlantic's and DETI's *Karst Mitigation Plan* (see appendix I) would be implemented to avoid or minimize potential impacts on the subterranean obligate species described in table S-1 of appendix S; however, due to the limited distribution of these species, alignment of the ACP route with potentially suitable habitat, and their high vulnerability to anthropogenic disturbance, it is possible that impacts associated with construction activities could have population-level effects on these species.

Plants

Surveys were conducted for federal, FS, and state sensitive plant species within the survey corridor in West Virginia. The results of these surveys are described in table S-1 in appendix S. Surveys are pending at 283.8 acres on ACP and 47.1 acres on SHP, and are anticipated to be complete by July 2017.

4.7.4.2 Virginia

The Virginia Endangered Species Act designates the VDGIF as the Commonwealth agency responsible for managing Commonwealth listed and special concern fish and wildlife species. The VDCR is responsible for managing Commonwealth listed plant and insect species, as designated under the Virginia Endangered Plant and Insect Species Act. The VDCR also maintains the Virginia Natural Heritage Program information on habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations. Atlantic consulted with the VDGIF and VDCR to identify rare, threatened or endangered plant or wildlife species with the potential to occur in the ACP project area.

In addition, Virginia also maintains an SGCN list and recently published its *2015 Draft Virginia Wildlife Action Plan* (VDGIF, 2015b). Virginia has assigned a Tier ranking for each species based on rarity and imperilment as follows:

- Tier I – Critical Conservation Need: faces extremely high risk of extinction or extirpation; populations are at critically low levels, face immediate threat(s), or occur within an extremely limited range.
- Tier II – Very High Conservation Need: has a high risk of extinction or extirpation; populations are at very low levels, face real threat(s), or occur within a very limited distribution.
- Tier III – High Conservation Need: extinction or extirpation is possible; populations are in decline, have declined to low levels, or are restricted in range.
- Tier IV – Moderate Conservation Need: rare in parts of its range, particularly on the periphery; populations have demonstrated a declining trend or a declining trend is suspected.

In addition to the Tier ranking, Virginia assigned a Conservation Opportunity ranking to all species as follows:

- a – Managers have identified species or habitat management strategies which can be implemented
- b – Managers have identified species or habitat management strategies, which cannot be implemented.
- c – Species or habitat management strategies have not been identified or have been exhausted.

Species with the potential to occur in or near ACP were determined primarily through the review of the Virginia Natural Heritage Program data, review of VDGIF Fish and Wildlife Information Service (VDGIF, 2016b) and other VDGIF wildlife publications, NatureServe Explorer (NatureServe, 2015), information provided through informal consultation with the VDGIF and VDCR, and 2015 and 2016 field surveys conducted by Atlantic and DETI.

The Virginia state-listed or SGCN that are also ESA-listed, proposed, or under review for listing are discussed in more detail in section 4.7.1. Marine mammals that have the potential to occur in the ACP project area are discussed in section 4.7.2. Bald and golden eagles and other migratory birds are discussed in detail in section 4.5.3. Virginia state-listed, or SGCN that are also GWNF RFSS, MIS, or locally rare species are indicated by footnotes in table S-2 in appendix S and are further discussed in section 4.7.3.

Table S-2 in appendix S describes the habitat where Virginia state-listed species and SGCN are typically found. Virginia uses the Northeast Terrestrial and Aquatic Habitat Maps and the Habitat Classification Guide (Anderson et al., 2013), described further in section 4.4, as a basis to map both terrestrial and aquatic wildlife habitat. Most impacts on state-listed species and SGCN are a function of the type of habitat disturbed (habitat association), the length of time necessary for important habitat characteristics to be restored, species mobility, species dependence on specific habitat features, or species disturbance tolerance. Only state-listed species and SGCN that have documented occurrences and potentially suitable habitat within the ACP project area have been included in table S-2 because there may be a direct impact on the species' forage habitat, and/or roosting/breeding sites.

The VDGIF and VDCR requested biological surveys for certain state-listed and sensitive species. The results of these surveys are described in table S-2 in appendix S. As of May 2017, approximately 1,349 acres and 98 sites have not been surveyed for biological resources in Virginia; this include surveys for bats, small mammals, tiger salamanders, Mabee's salamanders, Roanoke logperch, freshwater mussels, GWNF RFSS insects, and plants, which are expected to be completed in 2017. GWNF RFSS insects are discussed in section 4.7.3 and appendix R.

In addition to the species-specific mitigation measures described in table S-2 in appendix S, Atlantic has committed to certain measures for snakes, fish, freshwater mussels, and cave invertebrates, as described below.

Bats

Surveys were conducted for state-listed bat species in Virginia, including eastern (Rafinesque's) big-eared bat (*Corynorhinus rafinesquii macrotis*), little brown bat (*Myotis lucifugus lucifugus*), tri-colored bat (*Perimyotis subflavus*), and Virginia SGCN, including the southeastern myotis (*Myotis austroriparius*), and eastern small-footed bat (*Myotis leibii*). All species and/or their suitable habitat were observed during 2015 and/or 2016 surveys, as described in table S-2 in appendix S. Surveys are pending at 68 sites on both the GWNF and private lands, and include acoustic, mist-net, and hibernacula surveys. Surveys are anticipated to be completed in October 2017. Discussions regarding potential impacts to karst and bat hibernacula are ongoing with the FERC, FWS, FS, WVDNR, and VDGIF.

Small Mammals and Amphibians

Small mammal surveys were conducted for the Allegheny woodrat (*Neotoma magister*), southern rock vole (*Microtus chrotorrhinus carolinensis*), southern water shrew (*Sorex palustris punctulatus*), and American water shrew *(Sorex palustris*) (refer to table S-2 in appendix S). Small mammal surveys are pending at 43.3 acres of survey corridor, and are anticipated to be completed in June 2017.

The VDGIF also requested surveys for the Mabee's salamander and tiger salamander. There are 37.6 acres of pending habitat assessments, and two-year 2 trapping survey sites pending for Mabee's salamander, which are scheduled for completion in June 2017. There are 604.7 acres of habitat assessments for tiger salamanders, and one-year 2 trapping survey site pending for the tiger salamander, which are scheduled for completion in May 2017.

Snakes

To minimize potential impacts to the canebrake rattlesnake (Coastal Plain population) (*Crotalus horridus*), timber rattlesnake (*C. horridus*), and the scarlet kingsnake (*Lampropeltis elapsoides*), Atlantic developed the *Protected Snake Conservation Plan* (see table 2.3.1-1), which identifies the specific conservation measures that will be implemented within 2 miles of ACP in Virginia during construction from April 1 through October 31. These measures include:

- a “No Kill” policy for all snake species;
- providing educational training on the identification and conservation measures for each snake species;
- enforcement of posted speed limits on county and state roads and at the construction site; and
- retention of a qualified Biological Monitor the appropriate collection permit to:
  - conduct visual inspections for the presence of snakes:
    - prior to tree clearing;
    - when equipment or vehicles are staged or moved;
    - prior to excavation; and
    - in open trenches and bore pits prior to backfilling; and
  - stop work, document snake location, relocate snake, and contact the VDGIF.

Snake surveys in Virginia are complete.

Fish

To minimize impacts on Roanoke logperch (see section 4.7.1.10), and other sensitive fish species, Atlantic developed the *Virginia Fish Relocation Plan* (see table 2.3.1-1). At every perennial and intermittent waterbody crossed by dry crossing techniques along ACP in Virginia, all fish species that are trapped within the areas proposed for dewatering or in-stream work must be removed within 24 hours after the work area has been isolated. Removed species must then be documented and relocated to suitable habitat outside of the work area. Construction and fish relocation efforts must not be conducted during applicable TOYR for any protected species likely to be encountered at that location. A report of the fish removal and relocation effort must be provided to the FWS and VDGIF upon completion. Roanoke logperch habitat assessment surveys are pending at one waterbody crossing location and is anticipated to be complete in June 2017.

Atlantic has proposed to install an in-stream support for a bridge across both Waqua Creek and Sturgeon Creek where Roanoke logperch have been assumed. The center support for a span bridge would not require any digging and would result in minimal disturbance to the stream bed. However, this work has been proposed during the VDGIF TOYR for Roanoke logperch in May 2019. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary the results of consultation with the VDGIF regarding in-stream construction activities proposed during the Roanoke logperch VDGIF TOYR at Waqua Creek and Sturgeon Creek. Documentation should include any additional conservation measures required by VDGIF, which should also be incorporated into the final ACP Master Waterbody Crossing table for each waterbody.**

Freshwater Mussels

The FWS Virginia Field Office and VDGIF have developed *Freshwater Mussel Guidelines* (FWS and VDGIF, 2015a) for Virginia outlining the mussel survey and relocation methodology for federal and state-listed and non-listed species. If impacts cannot be avoided, all streams that may contain suitable mussel habitat or that are known to harbor mussels must be surveyed; the type of assessment or survey is dependent upon the scope of the project, potential impacts, and known species distribution. In waterbodies where mussels are present, Atlantic would be required to prepare and submit a mussel relocation plan to the FWS and VDGIF for comment and approval prior to construction. The recommended time of year for mussel surveys and relocations is between April 1 and October 31. Additional TOYR may apply for construction and relocation efforts as directed by the VDGIF (see table S-2 in appendix S). Mussel surveys are proposed in 2017 at 26 waterbody crossing locations, which are anticipated to be completed by July 2017.

Atlantic has assumed presence of ESA-listed or under review freshwater mussel species at 15 waterbodies identified in appendix K. Atlantic conducted surveys in 2015 and 2016 in waterbodies along the route with the potential to support freshwater mussel species, and identified non-ESA- or state-listed mussels at 16 waterbody crossings. Surveys identified the following non-listed and non-SGCN species: triangle floater, box spike, creeper, tidewater mucket, eastern elliptio, northern lance, Carolina slabshell, and variable spike. Atlantic also identified the following Virginia SGCN species: paper pondshell, eastern lampmussel, and yellow lampmussel; and one state-listed species, the Atlantic pigtoe, which is also under review for listing by the FWS, was identified at two waterbody crossing locations (see section 4.7.1.15, appendix K, and table S-2 of appendix S).

As indicated above, Atlantic has committed to adhering to the applicable VDGIF TOYR (VDGIF, 2016a) for all in-stream activities in waterbodies where presence was documented during surveys or assumed based on agency data; these TOYR are reflected by waterbody in appendix K. We have recommended additional TOYR based on survey results and/or historic data per waterbody in appendix K. We recommend in section 4.7.1.10 that a hydrofracture potential analysis be conducted for Nottoway River (AP-1 MP 260.7) due to the potential presence of Roanoke logperch; however, there is also the potential presence of ESA-listed, proposed, and/or under review mussel species at these waterbodies, which further supports our recommendation for HDDs at this crossing location, if feasible.

In the June 16, 2017 Supplemental Filing from Atlantic and DETI, Atlantic indicated that because a decision for the listing of the green floater would not occur until 2020, conservation measures for this species where presence has been assumed would not apply. We agree that Atlantic would not need to implement the FWS' enhanced conservation measures described in section 4.7.1 at the waterbodies where this species has been assumed present; however, the green floater is listed as threatened in the Commonwealth of Virginia, therefore, the VDGIF TOYR for in-stream activities, including water withdrawal would still apply. Therefore, we continue to recommend in appendix K that Atlantic implement the VDGIF TOYR for green floater from April 15 to June 15 and August 15 to September 30 in all waterbodies where this species has been assumed present in Virginia, and intermittent and perennial tributaries within 1 river mile of these waterbodies.

Atlantic has also indicated in the June 16, 2017 Supplemental Filing that it would construct the cofferdam across the Meherrin River (AP-1 MP 286.3) in August 2019, which would conflict with the Atlantic pigtoe VDGIF TOYR to re-stabilize vegetation more quickly and to reduce run-off and sedimentation. However, the VDGIF TOYR for Atlantic pigtoe is May 15 to July 31; therefore, the proposed construction timing would not conflict. We have also recommended in section 2.4 that, in order to facilitate the agency's ability to identify and prioritize conflicts between avoidance and conservation measures, and to subsequently provide that information to Atlantic, DETI, and permitting agencies for incorporation into the construction plans, Atlantic and DETI provide environmental constraints maps illustrating the avoidance and minimization measures required by the resource agencies and committed to by Atlantic and DETI along the ACP and SHP routes.

In addition, Atlantic has proposed to conduct a flume crossing in July 2019 of Sturgeon Creek where both Atlantic pigtoe and dwarf wedgemussel have been assumed present, which is during VDGIF's TOYR for Atlantic pigtoe (May 15 to July 31) and for dwarf wedgemussel (March 15 to July 31 and August 15 to October 15). Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary the results of consultation with the VDGIF regarding in-stream construction activities proposed during the VDGIF TOYR for green floater in waterbodies where presence has been assumed for this species (see appendix K of the EIS), in addition to in-stream construction activities proposed at Sturgeon Creek during the VDGIF TOYR for Atlantic pigtoe and dwarf wedgemussel. Documentation should include any additional conservation measures required by the VDGIF, which should also be incorporated into the final ACP Master Waterbody Crossing table for each waterbody.**

Cave Invertebrates

Several subterranean obligate species, such as the cave-adapted amphipods (*Stygobromus* sp.), have the potential to occur in the ACP project area. These species are highly specialized to caves or other subterranean habitats and are only known from a limited number of sites within the Central Shenandoah planning region (see table S-2 in appendix S). These species typically are unable to survive outside of their subterranean habitat (VDGIF, 2015b).

The Final Karst Survey Report, described in section 4.1.2.3, identified karst features; however, due to the underground nature of these systems it is difficult to identify their full extent. Because no additional assessment was made of the karst features to determine whether they are appropriately suitable for any of the cave or subterranean obligate species (except bats), we assume that all karst features are suitable habitat for subterranean obligate species described in table S-2 of appendix S, and assume presence of these species. As discussed in section 4.1.2.3, the development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, as discussed in section 4.3.1.7, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's *Karst Mitigation Plan* (see appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts. The VDCR-DNH and the Virginia Cave Board have endorsed the revised *Karst Mitigation Plan* (see appendix I) as comprehensive, and indicate that the measures included would reduce the potential risk posed by ACP to karst resources. Atlantic would perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way, as described in section 4.1.2.3.

Atlantic's and DETI's *Karst Mitigation Plan* (see appendix I) would be implemented to avoid or minimize potential impacts on the subterranean obligate species described in table S-2 of appendix S; however, due to the limited distribution of these species, alignment of the ACP route with potentially suitable habitat, and their high vulnerability to anthropogenic disturbance, it is possible that impacts associated with construction activities could have population-level effects on these species.

Plants

Surveys were conducted for federal, FS, state-listed, and state sensitive plant species within the environmental survey corridor in Virginia. The results of these surveys are described in table S-2 in appendix S. Surveys are pending at 572.9 acres in the GWNF and on private land. Surveys are anticipated to be complete by October 2017.

4.7.4.3 North Carolina

The NCWRC is responsible for managing terrestrial and aquatic state-listed and special concern wildlife species under the North Carolina Endangered Species Act. The North Carolina Department of Agriculture is responsible for plant conservation. The North Carolina NHP is located within the North Carolina Department of Natural and Cultural Resources (NCDNCR) (formerly within the NCDEQ) and maintains and publishes the Rare Plant and Rare Animal lists every two years. These lists report the regulated state and federal status for plants and animals and NHP also identifies additional categories including "Significantly Rare" and the various levels of "Watch" list. These are non-regulatory statuses based upon evaluation of species' level of imperilment and level of knowledge of a species' status in the state.

Species with the potential to occur in or near ACP were determined primarily through the review of the North Carolina Natural Heritage Program data (NCDEQ, 2014d and 2014e), and other NCWRC and NCDNCR wildlife publications, NatureServe Explorer (NatureServe, 2015), information provided through informal consultation with the NCWRC, and 2015 and 2016 field surveys conducted by Atlantic. The NCWRC and NCDNCR requested that Atlantic conduct field surveys for several state-listed and special concern species, including bats, Neuse River waterdog, Carolina madtom, North Carolina spiny and Chowanoke crayfish, southern hognose snake, Bachman's sparrow, cerulean warbler, bald eagles, red-cockaded, woodpecker, freshwater mussels, and plant species. Atlantic conducted surveys for ESA-listed plant species in the ACP project area in North Carolina in 2015 and 2016 (see section 4.7.1.17). During these surveys, North Carolina state-listed and special concern plant species were also documented, if observed incidentally (see table S-3 in appendix S). Each of these species, its potential occurrence and general habitat information, and potential ACP-related impacts and conservation measures are summarized in table S-3 in appendix S.

The North Carolina state-listed or special concern species that are also ESA-listed, proposed, or under review for listing are discussed in more detail in section 4.7.1. Marine mammals that have the potential to occur in the ACP project area are discussed in section 4.7.2. Information on bald and golden eagles, rookeries and other migratory birds are discussed in section 4.5.3.

Table S-3 in appendix S describes the habitat where North Carolina state-listed and special concern species are typically found. NETHCS, described further in section 4.4, was used to describe terrestrial vegetation and wildlife habitat. Most impacts on state-listed and special concern species are a function of the type of habitat disturbed (habitat association), the length of time necessary for important habitat characteristics to be restored, species mobility, species dependence on specific habitat features, or species disturbance tolerance. Only species that have documented occurrences and potentially suitable habitat within the ACP project area have been included in table S-3 because there may be a direct impact on the species' forage species, and / or roosting / breeding sites.

The NCWRC and NCDNCR requested biological surveys for certain state-listed and sensitive species. The results of these surveys are described in table S-3 in appendix S. As of May 2017, approximately 74.5 acres have not been surveyed for biological resources in North Carolina; this includes surveys for bats, plants, the Carolina madtom, Neuse River waterdog, North Carolina spiny crayfish, and mussels. These surveys are anticipated to be completed in 2017.

In addition to the species-specific mitigation measures described in table S-3 in appendix S, Atlantic has committed to certain measures for fish and freshwater mussels, as described below.

Bats

Surveys were conducted for two bat species of concern in North Carolina: (Rafinesque's) big-eared bat (*Corynorhinus rafinesquii macrotis*) and the southeastern myotis (*Myotis austroriparius*). Both species and their roosting habitat were observed during surveys, as described in table S-3 in appendix S. Surveys are pending at nine sites (eight acoustic and one mist-net) in North Carolina, and are anticipated to be completed in June 2017.

Non-Mussel Aquatic Species

To minimize impacts on the Neuse River waterdog, Carolina madtom, Chowanoke crayfish (refer to sections 4.7.1.7, 4.7.1.11, and 4.7.1.14, respectively), North Carolina spiny crayfish, and other sensitive aquatic species, Atlantic has committed to implementing its *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* (see table 2.3.1-1). To reduce impacts on rare, threatened, and endangered species, Atlantic would remove individuals from waterbodies prior to placement of temporary dam structures. A second species removal effort would be necessary in dewatered areas to confirm all aquatic species have been removed. Refer to the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities* for additional information on the collection and relocation techniques. Pending aquatic surveys for the Neuse River waterdog (three waterbodies), Carolina madtom (five waterbodies), and North Carolina spiny crayfish (three waterbodies) are anticipated to be completed in July 2017.

Freshwater Mussels

Atlantic has also committed to implementing its *Freshwater Mussel Relocation Plan for ACP in North Carolina*. To reduce impacts on freshwater mussels, Atlantic would remove individuals from workspaces 6 months prior to in-stream construction activities. Atlantic submitted the *Freshwater Mussel Relocation Plan for ACP in North Carolina* to the FWS North Carolina Field Office and NCWRC on April 17, 2017 for review and concurrence. Atlantic will work with these agencies to address any comments and will submit a final plan when it is complete. Occupation surveys are pending at nine waterbodies, and are anticipated to be completed in July 2017. Mussel relocation surveys are currently proposed at 17 waterbody crossing locations prior to construction.

Based on FWS and NCWRC correspondence, freshwater mussel presence is assumed at the Roanoke River, Fishing Creek, Swift Creek, Contentnea Creek, Tar River, Little River, Neuse River, and Cape Fear River. Atlantic conducted surveys in 2015 and 2016 in waterbodies along the route with the potential to support freshwater mussel species and identified mussels at 17 waterbody crossing locations. Surveys identified the following non-listed mussel species: eastern elliptio, box spike, paper pondshell, northern lance, variable spike, *Elliptio mediocris*, Atlantic spike, and Carolina slabshell. Surveys also identified the following state-listed species: triangle floater, Roanoke slabshell, yellow lampmussel, eastern lampmussel, creeper, and Carolina fatmucket. Atlantic pigtoe, a state-listed mussel that is currently under review by the FWS for ESA listing, was also identified at four waterbody crossings (see section 4.7.1.15, appendix K, and table S-3 of appendix S).

State-listed mussel species were identified at five waterbodies that would be crossed by ACP; all but one of these locations would be crossed utilizing the HDD method. However, due to presence of other ESA-listed or under review species within this same waterbody, the FWS has requested that Atlantic consider utilizing the HDD method. We recommend in section 4.7.1.8 and appendix K that Atlantic provide an hydrofracture potential analysis for this waterbody, and if hydrofracture potential is low, use the HDD method to reduce potential impacts on sensitive species. If the HDD method is not feasible, Atlantic would consult with the FWS and NCWRC to determine what additional conservation measures would be recommended at this waterbody crossing location.

Plants

Atlantic conducted surveys in 2015 and 2016 for ESA-listed plant species with the potential to occur within the ACP project area and documented state-listed species, or rare species if observed during surveys for ESA-listed plants. This effort did not identify any state-listed species, but one occurrence of running oak (*Quercus elliottii*), a North Carolina Significantly Rare – Peripheral species was documented in Robeson County in 2015 (refer to table S-3 in appendix S). There are 74.5 acres of pending botanical surveys in North Carolina, which are anticipated to be completed by June 2017.

4.7.4.4 Pennsylvania

The Pennsylvania Game Commission (PAGC), PAFBC, and the PADCNR are responsible for managing Commonwealth-listed species and species of special concern. The PAGC manages birds and mammal species; PAFBC manages reptiles, amphibians, fish, and aquatic species; and the PADCNR manages plant and terrestrial invertebrate species. The PADCNR also maintains the Pennsylvania Natural Heritage Program (PNHP), which gathers and provides information on the location and status of Commonwealth listed species and species of concern. DETI consulted the PNHP and PAFBC and identified two special concern species with the potential to occur within the SHP Crayne Compressor Station study area: the three-ridge mussel (*Amblema plicata*) and puttyroot orchid (*Aplectrum hyemale*). Upon further consultation, PADCNR and PAFBC determined that surveys were not required for either species and that neither species would be significantly impacted by SHP. To minimize potential indirect impacts on mussel species, DETI would ensure all chemical storage, including fuel storage for equipment refueling, be located at least 100 feet from waterways, and would implement the sediment and erosion control measures described in the FERC *Plan* and *Procedures* (see table 2.3.1-1). No Pennsylvania Commonwealth-listed species would be impacted by SHP.

The Indiana bat and northern long-eared bat are two ESA-listed species with the potential to occur in the SHP project area, and are discussed in sections 4.7.1.3 and 4.7.1.4, respectively. Bald and golden eagles and other migratory birds are discussed in detail in section 4.5.3.

4.7.4.5 State-Sensitive Species Impact Assessments and Conservation Measures

Impacts on state-sensitive species and their habitats would typically be similar to those described for vegetation, and wildlife, and aquatic species and habitat, as discussed in sections 4.4, 4.5, and 4.6, respectively. Terrestrial wildlife, such as mammals, reptiles, and amphibians, could be subject to injury, mortality, or displacement during clearing and habitat loss along the right-of-way, and/or habitat degradation adjacent to the right-of-way. Birds could be affected by loss of nesting and/or foraging habitat during clearing, and they could be disturbed by human activity. Sensitive plants could also be lost during clearing and grading, and adjacent suitable habitat degraded due to changes in hydrology, soil compaction, or light, among other factors. Construction activities could also introduce or encourage the spread of invasive and noxious plant species, further degrading suitable habitat for plants and wildlife species. Due to existing pressures on these species and/or their habitat, which has resulted in their sensitive status, ACP and SHP construction and/or operation activities could result in impacts of greater magnitude, extent, and/or duration than those described for more common wildlife species and habitat in sections 4.4, 4.5, and 4.6. For species with high site fidelity and/or limited mobility, it is possible that construction activities that impact and alter their habitat could cause localized population declines or local extirpations. Potential impacts that would be anticipated for the sensitive species and/or their suitable habitat that have the potential to occur in ACP and SHP project areas are further described in appendix S.

To minimize impacts to these species, Atlantic and DETI would implement the FERC *Plan* and *Procedures* (see table 2.3.1-1), *Restoration and Rehabilitation Plan* (see appendix F), *HDD Plan* (see appendix H), *Karst Mitigation Plan* (see appendix I), *SPCC Plan, Timber Removal Plan, Invasive Plant*

Species Management Plan, Blasting Plan, Migratory Bird Plan, Protected Snake Conservation Plan, Fire Plan, Fugitive Dust Control and Mitigation Plan (see table 2.3.1-1), and the *COM Plan* (see appendix G) on NFS lands. Additional species-specific conservation measures would be implemented by Atlantic and DETI are described in appendix S.

4.8 LAND USE, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Land Use

Based on review of NLCD (Homer et al., 2015), 2013 and 2014 digital aerial photography, and 2014, 2015, and 2016 field reconnaissance data, the use of lands crossed by the projects are generally classified into the following categories and definitions:

- Agriculture: actively cultivated cropland, uncultivated pasture lands, and hay meadows, and managed tree plantations and harvested forests with shrub and grass/forb regeneration. Important crops grown in the project area include soybeans, cotton, corn, and tobacco. Other commonly grown commodities include wheat, sweet potatoes, peanuts, hay, melons, and vegetables.
- Forest: conifer dominated forests and woodlands, deciduous dominated forests and woodlands, deciduous dominated savannas and glades, floodplain/riparian forests, and mixed deciduous/coniferous forests and woodlands (does not include managed tree plantations).
- Developed: herbaceous areas (e.g., golf courses, road sides, parks, and air fields) and areas with impervious surfaces (e.g., roads), including single-family housing units, apartment complexes, row houses, and commercial/industrial areas.
- Open: disturbed lands, grasslands, shrub lands, beach and shore lands, and cliff, canyon, and talus lands.
- Wetlands: wetland areas identified by field surveys (see section 4.3.3) or in NWI data, including palustrine, estuarine, and forested wetlands.
- Open Water: areas of open water, generally with less than 25 percent cover of vegetation or soil, including inland waters of streams, river, ponds, and lakes, and coastal and near-shore estuarine and/or marine waters.

4.8.1.1 Pipeline Facilities

Land use impacts associated with ACP and SHP would include the disturbance of existing land uses within the construction right-of-way (including ATWS and water impoundment structures) during construction, and retention of a new permanent right-of-way for operation of the pipelines. Section 2.2.1 describes the pipeline right-of-way land requirements associated with ACP and SHP. Table 2.2.2-1 in section 2.2 lists where the pipeline rights-of-way for each project would be collocated with existing rights-of-way and the acreage of existing right-of-way that would be shared for construction and operation of the project. Table 4.8.1-1 summarizes the acreage of each land use type that would be affected by construction and operation of the pipeline facilities for the projects. Atlantic has proposed a 75-foot-wide permanent right-of-way for the AP-1 mainline on non-NFS lands; however, we recommend in section 2.2.1 that Atlantic only maintain a 50-foot-wide right-of-way. The operation impacts described in table 4.8.1-1 and in the sections that follow are based on a 50-foot-wide permanent right-of-way on AP-1. Discussions of open water and wetland resources are provided in sections 4.3.2 and 4.3.3, respectively.

TABLE 4.8.1-1

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
ATLANTIC COAST PIPELINE																
West Virginia																
Pipeline Right-of-Way																
AP-1 Mainline	167.2	68.2	7.3	3.1	1,171.9	471.4	62.6	26.5	24.7	10.3	11.1	6.9	4.3	1.7	1,449.1	588.1
ATWS [c]	40.7	0.0	1.9	0.0	92.6	0.0	15.4	0.0	4.3	0.0	0.1	0.0	0.1	0.0	155.1	0.0
Aboveground Facilities																
Compressor Station 1	27.9	23.9	0.0	0.0	41.1	20.6	1.5	<0.1	0.0	0.0	0.0	0.0	0.6	0.3	71.1	44.9
Kincheloe M&R Station [d]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Run M&R Station	<0.1	<0.1	<0.1	<0.1	2.0	2.0	0.7	0.7	0.0	0.0	<0.1	<0.1	0.0	0.0	2.9	2.9
Valves [g]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pig/Launcher Receivers [h]	0.0	0.0	0.0	0.0	<0.1	<0.1	0.4	0.4	0.0	0.0	0.1	0.1	<0.1	<0.1	0.6	0.6
Communication Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cathodic Protection	0.3	0.1	0.0	0.0	<0.1	<0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.3
Access Roads	46.3	41.0	3.2	3.1	280.4	276.8	60.1	57.9	25.2	26.3	4.6	3.0	1.9	1.9	421.7	410.0
Pipe/Contractor Yards																
Contractor Yard – Spread 01-A	43.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	43.6	0.0
Contractor Yard – Spread 02-A	36.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	38.3	0.0
Contractor Yard – GWNF6 Spread 02A-A	36.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	38.1	0.0
Contractor Yard – GWNF6 Spread 02A-B	75.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	77.5	0.0
Pipe Yard 01-A	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	9.3	0.0	0.0	0.0	<0.1	0.0	9.8	0.0
Contractor Yard – GWNF6 Spread 02-D	33.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.1	0.0	34.4	0.0

TABLE 4.8.1-1 (cont'd)

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Contractor Yard – GWNF6 Spread 03-A	19.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	<0.1	0.0	20.4	0.0
Contractor Yard – GWNF6 Spread 03-B	54.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0	0.0	0.0	0.0	65.1	0.0
Pipe Yard 04-A	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0
Pipe Yard 04-C	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0	7.7	0.0
Pipe Yard 06-A	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
West Virginia Subtotal	580.8	133.2	12.4	6.2	1,591.9	770.8	141.5	85.6	90.1	36.7	15.9	10.0	7.0	3.8	2,440.1	1,046.7
Virginia																
Pipeline Right-of-Way																
AP-1 Mainline	687.5	276.8	476.4	193.6	1,911.3	770.9	98.6	40.5	151.9	61.9	87.8	52.6	16.6	6.9	3,430.1	1,403.2
AP-3 Lateral	211.5	130.0	55.4	34.5	114.7	76.0	41.6	27.3	26.4	15.5	211.9	142.6	8.2	6.8	669.7	432.7
AP-4 Lateral	0.0	0.0	3.9	2.3	0.0	0.0	<0.1	<0.1	<0.1	<0.1	0.0	0.0	0.0	0.0	4.0	2.4
AP-5 Lateral	0.0	0.0	5.4	3.6	2.6	1.8	0.1	0.1	0.3	0.2	0.0	0.0	<0.1	<0.1	8.5	5.8
ATWS[c]	244.2	0.0	70.1	0.0	193.3	0.0	35.3	0.0	20.4	0.0	4.1	0.0	0.4	0.0	567.8	0.0
Aboveground Facilities																
Compressor Station 2	<0.1	<0.1	44.2	12.8	<0.1	<0.1	0.0	0.0	3.3	0.1	2.6	0.0	<0.1	0.0	50.3	13.0
Compressor Station 3	0.1	<0.1	0.3	0.1	<0.1	<0.1	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3
Woods Corner M&R Station[d]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Elizabeth River M&R Station	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	0.0	0.0	0.1	0.1	0.0	0.0	0.9	0.9
Brunswick M&R Station	0.0	0.0	<0.1	<0.1	0.0	0.0	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5
Greenville M&R Station	0.0	0.0	1.0	1.0	0.1	0.1	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	1.4	1.4
Valves[g]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pig/Launcher Receivers[h]	0.0	0.0	1.3	1.3	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5
Communication Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Cathodic Protection	1.2	0.6	0.4	0.1	0.9	0.4	1.5	0.6	0.0	0.0	0.0	0.0	<0.1	<0.1	4.1	1.8
Access Roads	70.3	59.3	42.2	34.6	187.8	179.0	53.5	51.0	16.0	11.6	5.2	2.4	1.0	0.7	376.0	338.6

TABLE 4.8.1-1 (cont'd)

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Pipe/Contractor Yards																
Contractor Yard – Spread 03-A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.9	0.0	0.0	0.0	0.0	0.0	31.9	0.0
Contractor Yard – Spread 04-A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.4	0.0	0.0	0.0	0.0	0.0	36.4	0.0
Contractor Yard – Spread 04-A-A	58.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.6	0.0
Contractor Yard – GWNF6 Spread 03A-A	44.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.9	0.0
Contractor Yard – GWNF6 Spread 03A-B	50.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.7	0.0
Contractor Yard – Spread 05-C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.8	0.0	0.0	0.0	0.0	0.0	40.8	0.0
Contractor Yard – GWNF6 Spread 04-A	43.1	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.7	0.0	0.0	0.0	<0.1	0.0	43.8	0.0
Contractor Yard – Spread 06-C	23.4	0.0	0.0	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	36.5	0.0
Contractor Yard – Spread 07-B	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	<0.1	0.0	30.1	0.0
Contractor Yard – Spread 11-C	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	12.2	0.0	0.0	0.0	<0.1	0.0	17.8	0.0
Virginia Subtotal	1,465.5	466.7	700.7	284.1	2,425.6	1,029.8	238.5	121.7	340.7	89.5	311.7	197.7	26.3	14.5	5,509.4	2,204.4
North Carolina																
Pipeline Right-of-Way																
AP-2 Mainline	875.3	403.4	225.1	102.8	591.8	277.5	94.1	42.6	29.1	13.9	440.2	282.8	8.0	4.9	2,263.6	1,127.9
AP-3 Lateral	33.5	22.6	35.7	23.8	20.1	13.2	0.3	0.3	0.0	0.0	19.7	13.2	0.2	0.1	109.5	73.2
ATWS[c]	236.2	0.0	29.5	0.0	55.9	0.0	27.1	0.0	5.4	0.0	2.8	0.0	0.1	0.0	357.0	0.0
Aboveground Facilities																
Compressor Station 3	0.5	0.3	43.6	29.1	<0.1	<0.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	44.5	29.8
Smithfield M&R Station	1.3	1.3	4.2	4.2	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	5.6
Fayetteville M&R Station	6.4	6.4	<0.1	<0.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	6.9	6.9

TABLE 4.8.1-1 (cont'd)

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Pembroke M&R Station	2.5	2.5	0.0	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6
Valves [g]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pig/Launcher Receivers [h]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication Towers	0.1	0.1	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
Cathodic Protection	1.3	0.6	0.7	0.3	0.7	0.3	0.5	0.2	0.1	<0.1	0.2	0.1	0.1	<0.1	3.6	1.6
Access Roads	38.6	35.0	18.0	14.8	24.1	18.9	12.5	6.8	1.8	1.1	4.6	1.3	0.4	0.3	100.0	78.2
Pipe/Contractor Yards																
Contractor Yard – Spread 08-A	45.1	0.0	<0.1	0.0	0.0	0.0	<0.1	0.0	0.3	0.0	0.0	0.0	0.2	0.0	45.6	0.0
Contractor Yard – Spread 09-A	39.1	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.1	0.0	41.7	0.0
Contractor Yard – Spread 10-A	31.6	0.0	<0.1	0.0	8.1	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.0	40.2	0.0
North Carolina Subtotal	1,311.5	472.2	356.8	175.0	702.5	310.2	135.3	50.6	37.9	15.0	467.6	297.3	9.3	5.4	3,021.4	1,326.2
ACP Total	3,357.8	1,072.0	1,070.0	465.4	4,719.9	2,110.8	514.3	257.0	468.7	141.3	795.4	505.0	42.6	23.7	10,970.8	4,577.3
SUPPLY HEADER PROJECT																
West Virginia																
Pipeline Right-of-Way																
TL-635 Loopline	11.4	6.0	0.0	0.0	367.3	183.5	10.3	5.7	0.3	0.1	1.4	1.1	1.9	1.0	392.6	197.4
ATWS	2.7	0.0	0.0	0.0	65.7	0.0	2.8	0.0	0.1	0.0	0.0	0.0	0.1	0.0	71.4	0.0
Aboveground Facilities																
Burch Ridge Compressor Station	3.7	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	0.0
Mockingbird Hill Compressor Station	0.5	0.0	0.0	0.0	49.2	7.9	14.3	1.6	0.0	0.0	0.0	0.0	0.0	0.0	64.0	9.5
CNX M&R Station [f]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Valves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pig/Launcher Receivers	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Communication Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cathodic Protection	0.8	0.8	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8

TABLE 4.8.1-1 (cont'd)

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Access Roads	3.3	3.3	0.0	0.0	88.4	88.4	9.6	9.6	0.1	0.1	0.4	0.4	1.2	1.2	103.0	103.0
Pipe/Contractor Yards																
Contractor Yard 5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Contractor Yard 6	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	1.3	0.0
Contractor Yard 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0
Contractor Yard 8	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Contractor Yard 9	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0
Contractor Yard 10	0.0	0.0	0.0	0.0	0.0	0.0	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.5	0.0
West Virginia Subtotal	26.9	10.1	0.0	0.0	570.7	279.9	65.3	18.3	1.7	0.2	1.8	1.5	3.2	2.2	669.7	312.2
Pennsylvania																
Pipeline Right-of-Way																
TL-636 Loopline	17.8	9.4	0.1	0.1	21.9	10.8	4.1	2.2	0.0	0.0	1.0	0.7	0.1	0.1	45.0	23.3
ATWS	4.9	0.0	0.0	0.0	3.5	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.0
Aboveground Facilities																
JB Tonkin Compressor Station	3.0	1.9	0.0	0.0	0.2	0.2	10.3	0.9	0.0	0.0	<0.1	<0.1	0.1	0.0	13.7	3.1
Crayne Compressor Station	9.6	0.0	0.0	0.0	0.0	0.0	1.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0	12.6	0.0
Valves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pig/Launcher Receivers	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Communication Towers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cathodic Protection	0.6	0.6	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
Access Roads	4.5	4.5	0.1	0.1	4.0	4.0	3.7	3.7	0.0	0.0	0.1	0.1	0.2	0.2	12.6	12.6
Pipe/Contractor Yards																
Contractor Yard 1	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
Contractor Yard 2	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.4	0.0	0.0	0.0	0.0	0.0	3.3	0.0
Contractor Yard 3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Contractor Yard 4	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0
Contractor Yard 11 (Crayne Compressor Station)	26.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0	33.6	0.0
Pennsylvania Subtotal	67.9	16.4	0.2	0.2	29.7	15.1	27.1	7.3	8.9	0.0	1.1	0.8	0.4	0.3	135.4	40.2

TABLE 4.8.1-1 (cont'd)

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline and Supply Header Project (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/ Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Project/State/Component	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
SHP Project Total	94.8	26.5	0.2	0.2	600.4	295.0	92.4	25.6	10.7	0.2	2.8	2.2	3.6	2.5	805.1	352.4
ACP and SHP Projects Total	3,452.6	1,098.5	1,070.2	465.6	5,311.4	2,405.8	607.7	283.6	479.5	141.5	798.2	507.2	46.2	26.2	11,775.9	4,929.6

[a] Project-specific construction right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on typical construction right-of-way widths (125, 110, 75, 50, etc.) for the entire length of the pipelines discussed in section 2.2.1. The construction right-of-way would be reduced at certain locations (e.g., wetlands), some portions of the right-of-way would overlap with existing rights-of-way that have been previously disturbed, and/or the HDD method would be used to avoid direct impacts on land use.

[b] Project-specific operational right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on a typical operational right-of-way width as discussed in section 2.2.1. Most land use types would be allowed to revert to preconstruction conditions, limited vegetation maintenance would be allowed in wetlands, some portions of the right-of-way would overlap with existing rights-of-way that are maintained, and/or the HDD method would be used to avoid direct impacts on land use.

[c] Includes additional temporary workspace, topsoil segregation areas, and water impoundment structure locations.

[d] Kincheloe and Woods Corner M&R Stations impacts are associated with Compressor Stations 1 and 2, respectively.

[e] Of this total, approximately 122, 75, and 65 acres and 50, 25, and 20 acres consist of residential land that would be affected during construction and operation, respectively, of the AP-1 mainline, AP-2 mainline, and AP-3 lateral.

[f] CNX M&R Station impacts are included in ACP's Compressor Station 1.

[g] No additional land would be affected by construction and operation of the valves. The operational footprint of the valves would be within the permanent easements for the pipelines.

[h] No additional land would be affected by construction or operation of the pig launcher/receiver assemblies installed on the same sites and within the same fence lines as Compressors Stations 2 and 3 and the Smithfield, Pembroke, Elizabeth River, Brunswick, and Greensville M&R Stations.

Note: Due to rounding, totals may be off by up to 0.3 in places.

In general, constructing and operating ACP and SHP would result in temporary to permanent land use impacts. The effects of pipeline construction on open, agricultural, developed, and residential land would be expected to be minor and temporary to short term. Temporary to short-term impacts would result from clearing of existing vegetation, standing or row crops, and landscaping; ground disturbance from grading, creating the pipeline trench, backfilling the pipeline trench; and increased equipment traffic associated with construction activities. Impacts would include temporary loss of land use, disturbance of the visual landscape, increased noise and dust, and increased local traffic congestion. Landowner access to homes, fields, storage areas, and other infrastructure would be maintained. Temporary fencing would be used in affected pasture areas, with alternative feeding or boarding arrangements made if necessary. These impacts would be confined primarily to the duration of construction (temporary) and would end after the right-of-way is restored and revegetated and the temporary work areas are relinquished to the landowner.

Atlantic and DETI would implement their construction and restoration plans to minimize land use impacts during construction and operation of the pipeline facilities. These plans are introduced in section 2.3 and can be located as outlined in table 2.3.1-1. In addition, once finalized prior to construction, Atlantic would implement its *COM Plan*, which is specific to federal lands. Project-related impacts on and mitigation specific to federal lands is discussed in section 4.8.9.

Following construction, the land for the temporary construction right-of-way, ATWS, temporary access roads, and pipe/contractor yards would be restored and allowed to revert to prior uses, except for forest areas within the permanent right-of-way. Atlantic has proposed a 75-foot-wide permanent right-of-way to operate the AP-1 mainline. We recommend in section 2.2.1 that Atlantic should only maintain a 50-foot-wide easement along AP-1. On NFS land, Atlantic would maintain a 50-foot-wide long-term right-of-way in accordance with 30 U.S.C. 185 and FSM 2700, Chapter 2720, Section 2726.31c regulations. All other pipeline facilities would require a 50-foot-wide permanent right-of-way.

The land retained as permanent right-of-way would generally be allowed to revert to its former use and landowners would have use of the permanent right-of-way, except for forested land as discussed below. Also, certain activities such as the construction of permanent structures, including houses, house additions, trailers, tool sheds, garages, poles, patios, pools, septic tanks, or other objects not easily removable, or the planting of trees, would be prohibited within the permanent right-of-way. All access to NFS land through private land(s) would require long-term access for the FS to facilitate inspections of the permitted area on NFS lands. To facilitate pipeline inspection, operation, and maintenance, the entire permanent right-of-way in upland areas would be maintained in an herbaceous/scrub-shrub vegetated state. This maintained right-of-way would be mowed no more than once every 3 years, but a 10-foot-wide strip centered over the pipeline might be mowed annually to facilitate corrosion and other operational surveys. However, as discussed in section 4.5.3, annual mowing would not be allowed during bird nesting season for migratory birds. Also, in accordance with Atlantic's *Restoration and Rehabilitation Plan*, a 10-foot-wide corridor centered over the pipelines in wetlands may be permanently maintained in an herbaceous state, and trees within 15 feet of the pipeline in wetland areas may be cut and removed. These routine maintenance standards would not occur between the entry and exit points where an HDD or direct pipe crossing method is adopted.

We received comments on the draft EIS concerning deterring unauthorized access of the permanent right-of-way during project operation. Atlantic would place berms across the right-of-way where it intersects an existing road. While their primary purpose would be to control erosion, the berms would deter most vehicle access of the right-of-way. Atlantic would also place large rocks, stumps, limbs, and related material along the right-of-way such that they present a physical barrier. If requested by a landowner, locking gates may be installed along the right-of-way in accordance with Atlantic's specifications to allow for access by maintenance vehicles and equipment. Also, if requested by the landowner, Atlantic would place warning signs stating that OHV use is prohibited along the pipeline right-of-way. Atlantic would coordinate with the MNF and GWNF to design and define right-of-way barrier locations.

Specific to lands managed by the VDGIF, the agency has requested that the right-of-way be reduced on its lands (VDGIF, 2015c). Atlantic continues to consult with the VDGIF regarding ACP's construction and operational right-of-way. Also, at its request, VDGIF would be responsible for disposal of woody material cleared from the right-of-way, reseeding of the right-of-way, and maintenance of the right-of-way (VDGIF, 2015c). However, in accordance section V.D.1.a of the FERC *Plan*, Atlantic and DETI are ultimately responsible for the successful restoration of the right-of-way.

Specific impacts on agricultural land (including specialty crops), forest land, developed land, and open land areas are discussed below. Impacts on residential areas are discussed in section 4.8.3. Surface waters (open water) and wetlands are discussed in sections 4.3.2 and 4.3.3, respectively.

Agricultural Land

In agricultural areas consisting of cultivated crops and pasture, short-term impacts would include the disruption of farming operations for the growing season during the year of construction and interruptions to irrigation systems affected by pipeline construction activities. Farmers would experience some loss of crop production in areas directly disturbed by construction-related activities. Farmers may have to alter sowing patterns to best farm areas that may have limited access due to construction activity. Following construction, agricultural practices for cultivated crops and pasture land within the pipeline right-of-way would be allowed to resume. Atlantic and DETI would restore all disturbed agricultural areas associated with construction in accordance with their respective Plans. Typical mitigation measures include topsoil segregation, soil decompaction, and repair/replacement of irrigation and drainage structures damaged by construction. Impacts on and mitigation for prime farmlands and statewide important farmlands are discussed in section 4.2.

We received comments regarding loss of pasture land and impacts on grazing animals as a result of construction. Wildlife and livestock could fall into the trench if the trench is left open overnight. During construction, grazing animals may have to be moved to different areas or other fields, and/or be penned with gates. This would be coordinated between the landowner and Atlantic and DETI. Also, Atlantic and DETI would work with landowners to ensure adequate temporary fencing in grazing areas is maintained if cattle or other livestock are present during construction. Atlantic and DETI would install temporary soft plugs and ramps in the trench to provide passage across or egress from the open trench. The open trench would be inspected each morning to identify and relocate animals in the trench prior to continuing work. In addition, gaps would be left between topsoil and subsoil piles to for wildlife passage. This impact would be temporary and limited to the time of construction. In accordance with section III.C. of the FERC *Plan* and as stated in its *Restoration and Rehabilitation Plan*, Atlantic and DETI would develop grazing deferment plans with willing landowners, grazing permittees, and land-managing agencies. Atlantic and DETI may request that grazing deferments continue while the construction right-of-way is revegetated. However, pasture land and grazing practices would be allowed to continue during project operation.

Agricultural land includes managed tree plantations and harvested forests. Long-term to permanent impacts would be experienced in agricultural areas consisting of tree plantations and harvested forest, similar to the Forest Land discussion below. ACP would cross over 60 miles of tree plantation and harvested forest, the majority of which would be encountered in Virginia along the AP-1 mainline route. SHP would cross less than 0.1 mile of tree plantation and harvested forest along the TL-636 loopline route.

Impacts would include the removal of trees within the construction right-of-way and at ATWS, aboveground facility sites, and new or modified access roads. In the event agricultural crops cannot be reestablished within the permanent right-of-way, such as in managed tree plantations and harvested forest, landowners would be compensated to reflect the actual loss of net income provided by the existing crop through the life of the crop. Properly gated fences required for grazing animals or other agricultural practices would be allowed in the right-of-way with Atlantic's or DETI's consent, provided the fence posts are located at least 5 feet away from the pipeline.

The discussions below focus on agricultural programs that the project facilities would affect during construction and operation.

Specialty Crops and Organic Farms

Section 101 of the Specialty Crops Competitiveness Act of 2004 (7 U.S.C. 1621 note) and amended under section 10010 of the Agricultural Act of 2014, Public Law 113-79 (the Farm Bill) defines specialty crops as "fruits and vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)." Eligible plants must be cultivated or managed and used by people for food, medicinal purposes, and/or aesthetic gratification to be considered specialty crops (USDA, 2016a).

Based on Atlantic's and DETI's consultations with landowners, two specialty crop areas were identified along ACP. At AP-2 MP 58.1, ACP would cross a persimmon orchard, temporarily affecting 1.0 acre of agriculture (forest) land. Atlantic would compensate the landowner for crop losses incurred during construction. Because the permanent right-of-way would result in the long-term loss of one or more rows of orchard trees, Atlantic would also compensate the landowner for the permanent impact.

At AP-2 MP 110.4, ACP would cross a blueberry farm. However, Atlantic has adjusted the pipeline route and workspace so that removal of blueberry bushes would not be required during construction or operation of the project. Similar to other land use impacts, adjacent lands may experience dust during construction. However, this impact would be temporary and controlled along the right-of-way in accordance with Atlantic's *Fugitive Dust Control and Mitigation Plan* as discussed in section 4.11.1.

In addition, based on Atlantic's and DETI's consultations with landowners, the projects would cross private commercial tree farms (the locations are identified in table 4.8.1-2). ACP would cross 39.0 miles of commercial tree farm; SHP would cross 1.7 miles of commercial tree farm.

Impacts on forested specialty crops would be the same as that described below under the Forest Land discussion, which includes implementing Atlantic's and DETI's *Timber Removal Plan, Open Burning Plan*, and *Fire Plan* to minimize the impacts of the projects on harvested forests on private land to the extent practicable and would not be significant or adverse. Timber removal practices on and compensation for timber loss on private lands would be established during the easement negotiation process.

We received comments regarding potential impacts on trees used to extract maple syrup. Hardwood trees in the project area, such as Highland County, Virginia, are known to contain sugar maple stands used to produce maple syrup. Based on Atlantic's and DETI's consultations with landowners, no known sugar maple stands would be crossed by the projects. However, impacts on trees used to extract maple syrup would be the same as those described in the Forest Land discussion below.

TABLE 4.8.1-2			
Commercial Tree Farms Crossed by the Atlantic Coast Pipeline and Supply Header Project [a]			
Project/Facility, State or Commonwealth/ County or City	Begin Milepost	End Milepost	Owner
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
West Virginia			
Randolph	49.1	55.7	Coastal Forest Resource Company
	55.7	56.8	Beckwith Lumber Company
	56.8	58.1	Coastal Forest Resource Company
	58.1	58.8	Beckwith Lumber Company
	59.2	60.0	Beckwith Lumber Company
	61.2	64.4	Beckwith Lumber Company
Virginia			
Nelson	181.1	182.8	Plum Creek Timberlands, L.P.
Buckingham	187.4	189.7	Plum Creek Timberlands L.P.
	192.6	194.7	Plum Creek Timberlands L.P.
	197.1	197.5	River's Bluff Ranch LLC
	198.3	198.5	Plum Creek Timberlands L.P.
	201.1	202.2	Monticello Forest, LLC c/o Regions Timberland Group
	202.9	203.5	American Timberland, LLC c/o Regions Timberland Group
	203.5	204.0	Solitude, LLC
	204.0	204.5	Monticello Forest, LLC c/o Regions Timberland Group
Cumberland	211.8	212.4	American Timberland, LLC
Nottoway	245.7	245.8	Keystone Forest Investments, LLC c/o Forest Investment Associates L.P.
Dinwiddie	252.3	253.6	TIAA Timberlands 1, LLC c/o Hancock Forest Management
	255.1	256.0	Scott Timberland and Company, L.P.
Brunswick	263.1	263.9	FIATP Timber LLC and Forest Investment Associates L.P.
	266.8	267.9	Timbervest Partners II VA, LLC
	271.1	271.2	American Timberland, LLC
	271.5	272.0	Eastern Woodlands Corporation
	272.0	273.0	FIATP Timber, LLC
	273.5	274.1	Belvedere Timber, LLC c/o Forest Investment Associates
	276.8	277.2	Strickler, LLC
	277.2	277.4	Stonewall Timberlands, LLC
	278.4	278.6	Adirondack Timber Co. Inc. c/o Forest Investment Associates
	278.9	279.5	Stonewall Timberlands LLC, c/o/ CT Corporation Systems
Greensville	283.1	283.9	Family Tree Properties, LLC
	284.3	284.8	Family Tree Properties, LLC
	284.8	286.3	Real Tree Wood Corporation
	286.3	288.1	Charlie Brown Farms, LLC
	287.9	287.9	Belvedere Timber, LLC c/o Forest Investment Associates
	297.5	299.0	Coastal Forest Resources Company dba Coastal Timberlands Company
	290.7	291.7	Coastal Lumber Co. dba Coastal Timberlands Company

TABLE 4.8.1-2 (cont'd)			
Commercial Tree Farms Crossed by the Atlantic Coast Pipeline and Supply Header Project [a]			
Project/Facility, State or Commonwealth/ County or City	Begin Milepost	End Milepost	Owner
AP-2 Mainline			
North Carolina			
Northampton	0.1	0.7	FIATP Timber LLC and Forest Investment Associates Limited Partnership
	3.4	4.6	4D Farms, LLC
	5.2	6.0	Robinson Farms, LLC
	9.4	9.8	JE Kerr Timber Company
Halifax	9.9	10.2	Coastal Lumber dba Coastal Timberlands Company
	10.2	10.6	Taylor Farm Timber LLC
	10.6	12.2	Coastal Lumber dba Coastal Timberlands Company
Johnston	77.8	78.2	Brunswick Timber LLC c/o Forest Investments Associates LP
	97.3	98.4	Neuse Tree Farm, LLC
Cumberland	137.0	137.1	Southern Diversified Timber LLC
	140.0	140.7	Percival Land and Timber LLC; C/O Joe Sanderson Us Trust
	141.6	141.7	Red Mountain Timber Co I LLC; C/O Resource Management
	147.6	147.7	Brunswick Timber LLC c/o Forest Investments Assoc.
Robeson	1661.0	161.3	Red Mountain Timber Co. LLC c/o Resource Management Service
	162.0	162.2	Southern Diversified Timber LLC
AP-3 Lateral			
North Carolina			
Northampton	4.7	5.4	FIATP SSF Timber LLC
	5.9	6.3	Stonewall Farm Properties, LLC
	6.3	6.6	West Fraser, Inc.
	6.6	7.5	FIATP SSF Timber LLC
	8.2	8.6	FIATP SSF Timber LLC
	11.8	12.1	Blue Sky Timber Properties LLC
Virginia			
Southampton	28.3	28.7	FIATP Timber, LLC c/o Forest Investment Associates, L.P.
	34.8	35.8	FIATP Timber, LLC c/o Forest Investment Associates, L.P.
Suffolk, City of	51.6	51.6	Timbervest Partners III VA, LLC
AP-5 Lateral			
Virginia			
Greensville	0.0	1.1	Family Tree Properties, LLC
SUPPLY HEADER PROJECT			
TL-635 Loopline			
West Virginia			
Wetzel	31.4	33.1	Coastal Lumber Company and Coastal Forest Resources Co

[a] Timber farm data from NLCD (Homer et al., 2015) and field surveys.

We received comments during the scoping period regarding potential impacts on organic farms. Comments included concern that:

- affected organic farms would no longer be able to produce food for the Satchidananda Ashram-Yogaville community and Light of Truth Universal Shrine in Buckingham, Virginia;

- organic farms on Shannon Farms Community in Nelson County, Virginia would be destroyed; and

- certified organic agricultural operations may no longer be eligible for certification due to contamination.

Farms can be certified as organic if they fulfill a set of standards outlined as part of the National Organic Program. Organic farms produce products using methods that preserve the environment and avoid most synthetic materials, such as pesticides and antibiotics. Organic farmers, ranchers, and food processors must follow a defined set of standards to produce organic food and fiber (USDA, 2016b). Organic certification can be obtained by consulting with a private, foreign, or state entity, referred to as a certifying agent, which has been accredited by the USDA (USDA, 2016c).

The organic certification process involves developing and implementing an individualized *Organic System Plan* by a landowner. The *Organic System Plan* outlines the practices and procedures to be performed and maintained, a list of each substance to be used as a production or handling input, a description of monitoring practices, the record-keeping systems, and management practices and physical barriers established to prevent commingling and contact with prohibited substances (7 CFR 205.201). Organic System Plans are proprietary in nature.

Based on consultations with landowners, Atlantic identified the following certified organic farms that would be crossed:

- AP-1 MPs 141.8 to 142.4 in Augusta County, Virginia. Certified organic milk and corn farm.

- AP-2 MPs 118.8 to 118.9 in Sampson County, North Carolina. Certified organic hog farm. The proposed pipeline route would temporarily impact a breeding pen.

Based on consultations with landowners, Atlantic also identified the following farms that are organically managed but have not been officially certified by a certifying agent as organic:

- AP-3 MP 42.3 in the City of Suffolk, Virginia. Organically managed farm that raises horses.

- AP-3 MP 43.9 in the City of Suffolk, Virginia. Organically managed farm that raises goats, horses, and chickens.

None of the organic farms identified along the ACP route would be near the Satchidananda Ashram-Yogaville and Shannon Farms communities, which are over 1 mile from approximate AP-1 MPs 186 and 167, respectively. Regardless, should any additional organic farms be identified as affected by the projects, including organic farms that may serve these communities, Atlantic and DETI would implement the measures identified below.

We received comments expressing concern regarding the potential use of herbicides at non-organic farms that are near certified organic farms, and impacts on organic and certified pesticide free areas that could harm commercial and business activities. To minimize project-related impacts on the organic farm at AP-1 MPs 141.8 to 142.4, as well as any other certified organic farms or farms in active transition toward certification identified as crossed by ACP or SHP, Atlantic and DETI would develop a site-specific *Organic Farm Protection Plan* for certified organic farms that would identify prohibited substances; soil handling and equipment cleaning procedures; invasive weed, water, and erosion controls; and restoration and monitoring methods that would be used during construction and operation. At a minimum, Atlantic and DETI would implement the following mitigation measures:

- Atlantic and DETI would coordinate with the landowner or tenant, the landowner's or tenant's certifying agent, and/or a mutually acceptable third-party organic certifier to identify site-specific construction practices that would avoid the potential for decertification as a result of construction activities.

- Prohibited substances (as identified through review of the landowner's *Organic System Plan* and/or consultations with the landowner) would not be applied onto certified organic agricultural land. Also, prohibited substances would not be allowed to drift onto certified organic agricultural land.

- Topsoil and subsoil would be stored separately and replaced in the same sequence after the pipeline is installed.

- Topsoil and subsoil would not be removed from or imported to certified organic agricultural land.

- During construction, an earthen plug would be placed in the pipeline trench at the boundary of certified organic agricultural land to prevent trench water from adjacent land flowing into the trench on certified organic agricultural land.

- To the extent feasible, invasive plant species controls would be consistent with the landowner's or tenant's *Organic System Plan*.

- Permanent erosion control methods would be used consistent with the landowner's or tenant's *Organic System Plan* such that sediment from adjacent non-organic agricultural land does not flow onto the right-of-way and deposited on certified organic agricultural land.

- Atlantic and DETI would compensate organic farm landowners for any damages resulting from construction of the projects.

Regarding the certified organic hog farm (AP-2 MPs 118.8 to 118.9), Atlantic would restore the right-of-way using the originally removed soil that is currently free from contaminants and would use machinery that is free of any outside soil and/or contaminants to ensure certification as a USDA-certified organic farm does not lapse or it forfeited as result of the project.

Atlantic would verify with the landowners of organically managed farms the status of becoming a certified organic farm; if ACP would affect continued or future designation as a certified organic farm; and, as appropriate, developing a site-specific *Organic Farm Protection Plan*.

Atlantic has not yet developed site-specific *Organic Farm Protection Plan*s for our review. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a site-specific *Organic Farm Protection Plan* for the certified organic farms affected by ACP, including (but not limited to) the milk and corn farm crossed between AP-1 MPs 141.8 and 142.4; the certified organic hog farm crossed between**

AP-2 MPs 118.8 and 118.9; and any additional certified organic farms not previously identified prior to construction.

We received comments on the draft EIS stating that the ACP would cross organically managed land in the Pocahontas Organic District in Pocahontas and Randolph Counties, West Virginia. The lands in this district may include certified organic or transitioning to certified organic farms. Atlantic confirmed that the project would not cross any additionally certified organic lands beyond that discussed above. If additional certified organic lands are identified, Atlantic would be required to implement the measures identified in the *Organic Farm Protection Plan*. Further, for lands transitioning to organic but not certified, landowners have the opportunity to request that site-specific factors and/or development plans for their property be considered during easement negotiations, and that specific measures be taken into account.

We conclude that implementation of the identified mitigation measures, including Atlantic's and DETI's commitment to compensate the landowner(s) for project-related impacts and to identify site-specific construction practices that would avoid the potential for decertification as a result of construction activities, and our recommendation above, would minimize or mitigate the impacts of the project on certified organic farms. Overall, construction activities would result in temporary impacts; operational impacts would be limited to the encumbrance of a permanent right-of-way, which would prevent the construction of permanent structures and trees within the right-of-way.

Agricultural and Forest Management Programs

Farm Service Agency Programs

The USDA, NRCS and Farm Service Agency (FSA) oversee several voluntary conservation-related programs that work to address farming, ranching, grassland, forestland, and water-related conservation issues (FSA, 2016a; NRCS, 2016c). The Conservation Reserve Program (CRP), which is administered by the FSA, is the country's largest private-land conservation program. The CRP is a voluntary program for agricultural landowners that is focused on taking highly erodible cropland out of production and stabilizing soil loss through planting permanent cover crops (FSA, 2016b). Landowners enrolled in the CRP receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland (FSA, 2016b). The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. Based on agency consultations, review of NRCS-provided data, and easement negotiations with landowners (as of July 2016), several NRCS or FSA easements would be crossed by the ACP route (see table 4.8.1-3); no NRCS or FSA easements would be crossed by the SHP route.

In addition, as listed in table 4.8.1-3, Atlantic's AP-2 mainline and AP-3 lateral would be located within 0.25 mile of several Conservation Reserve Enhancement Program (CREP) easements in North Carolina. The CREP, an offshoot of the CRP, is a voluntary program administered by the FSA and focuses on conservation issues identified by local, state, or tribal governments or non-governmental organizations (FSA, 2016c). In exchange for removing environmentally sensitive land from production and introducing conservation practices, farmers, ranchers, and agricultural landowners are paid an annual rental rate and retain private ownership (FSA, 2016d). In North Carolina, a CREP conservation easement is a written agreement between a landowner and the state in which conservation practices that protect natural resources are adopted (North Carolina Department of Agriculture and Consumer Services, 2016).

TABLE 4.8.1-3

Natural Resources Conservation Service and Farm Service Agency Program Easements Crossed by and within 0.25 Mile of the Atlantic Coast Pipeline [a]

Facility/County or City, State or Commonwealth	Type of Easement	Begin Milepost	End Milepost	Crossing Length (feet) [b]	Impacts (acres) [b]	
					Construction	Operation
AP-1 Mainline						
Augusta, VA	FSA/CRP	139.3	139.7	2,000	6.9	3.4
Augusta, VA	FSA/CRP	140.0	140.1	450	1.9	0.8
Augusta, VA	FSA/CRP	140.1	140.2	250	2.4	0.4
Nelson, VA	FSA/CRP	173.6	174.0	2,300	6.6	4.0
Nelson, VA	FSA/CRP	174.1	174.2	500	1.1	0.9
Buckingham, VA	FSA/CRP	209.4	209.5	260	0.8	0.4
Prince Edward, VA	FSA/CRP	220.8	221.1	2,000	5.5	3.4
Dinwiddie, VA	FSA/CRP	256.5	256.7	1,000	3.1	1.7
AP-2 Mainline						
Johnston, NC	FSA/CRP	96.6	96.9	1,300	1.7	2.2
Halifax, NC	CREP	17.2	17.2	N/A	N/A	N/A
Halifax, NC	CREP	19.4	19.4	N/A	N/A	N/A
Halifax, NC	CREP	26.4	26.4	N/A	N/A	N/A
Halifax, NC	CREP	26.6	26.6	N/A	N/A	N/A
Halifax, NC	CREP	26.7	26.7	N/A	N/A	N/A
Halifax, NC	CREP	27.2	27.2	N/A	N/A	N/A
Halifax, NC	CREP	28.7	28.7	N/A	N/A	N/A
Halifax, NC	CREP	32.6	32.6	N/A	N/A	N/A
Nash, NC	CREP	35.1	35.1	N/A	N/A	N/A
Nash, NC	CREP	38.8	38.8	N/A	N/A	N/A
Johnston, NC	CREP	97.7	97.7	N/A	N/A	N/A
Johnston, NC	CREP	97.7	97.7	N/A	N/A	N/A
Johnston, NC	CREP	98.1	98.1	N/A	N/A	N/A
Johnston, NC	CREP	98.2	98.2	N/A	N/A	N/A
Johnston, NC	CREP	98.3	98.3	N/A	N/A	N/A
Johnston, NC	CREP	98.3	98.3	N/A	N/A	N/A
Johnston, NC	CREP	98.3	98.3	N/A	N/A	N/A
AP-3 Lateral						
Northampton, NC	CREP	7.7	7.7	N/A	N/A	N/A
Southampton, VA	FSA/CRP	20.4	20.7	1,600	3.2	1.8
Southampton, VA	USDA/NRCS	23.5	23.7	1,200	2.2	1.3
City of Suffolk, VA	FSA/CRP	48.1	48.2	500	1.0	0.6
City of Suffolk, VA	USDA/NRCS	56.4	56.7	1,500	4.0	1.7

[a] No known NRCS or FSA program easements would be crossed by the AP-4 and AP-5 laterals associated with ACP or by SHP.

[b] N/A = Project does not cross feature. However, the project is within 0.25 mile of the feature (if area affected are listed as “N/A”) or ATWS would affect the feature (if construction acres are listed).

CREP = Conservation Reserve Enhancement Program

Project-related impacts on agricultural lands enrolled in farming-related programs would be temporary. Agricultural lands would be returned to agricultural use as soon as practicable after final grading. Consistent with the FERC *Plan*, cultivated cropland is typically not reseeded by the pipeline company because it may interfere with crops planted by the landowner. However, if seeding is requested, seed mixes would be determined in consultation with the landowner/tenant and agency recommendations in accordance with Atlantic’s and DETI’s *Restoration and Rehabilitation Plan*.

If other land use types are identified as crossed, such as forest, Atlantic and DETI would consult with the landowner regarding all construction and post-construction activities to minimize impacts on lands that participate in various tax incentive programs administered by the NRCS or FSA.

We conclude that implementation of the identified mitigation measures, including Atlantic's and DETI's commitment to verify the presence of NRCS and FSA program easement lands prior to construction and to consult with the landowner(s) to promote continued participation in these programs, would minimize or mitigate the impacts of the projects on NRCS and FSA program easements. Overall, construction activities would result in temporary impacts; operational impacts would be limited to the encumbrance of a permanent right-of-way, which would prevent the construction of permanent structures and trees within the right-of-way.

Virginia Century Farms

The Virginia Century Farm Program recognizes and honors farms that have been in operation for at least 100 consecutive years (VDACS, 2016). Participation in the program requires that a farm has been owned by the same family for at least 100 consecutive years; be lived on, or farmed by, a descendent of the original owners; and, with some exceptions for silviculture, gross more than $2,500 annually from the sale of farm products (Code of Virginia, Section 3.2-105). As a designated Virginia Century Farm, families receive a certificate signed by the Governor and the Commissioner of the VDACS, and a sign appropriate for outdoor display. There are currently over 1,300 farms recognized as Virginia Century Farms (VDACS, 2016). Table 4.8.1-4 lists the Virginia Century Farms crossed by ACP. SHP is not located in Virginia and, therefore, it would not affect any Virginia Century Farms. Further, there is no known similar program in West Virginia, North Carolina, and Pennsylvania that would be affected by the projects.

TABLE 4.8.1-4

Virginia Century Farms Crossed by the Atlantic Coast Pipeline

Facility/County	Begin Milepost	End Milepost	Length Crossed (feet)	Land Use	Area Affected by Construction (acres)
AP-1 Mainline					
Augusta	87.4 [b]	89.0 [b]	8,400	Agriculture	27.7
Augusta	136.3	137.0	3,400	Agriculture	9.8
Augusta	145.4	145.9	2,900	Agriculture	8.3
Cumberland	213.2	213.5	1,600	Open/Agriculture	4.6
Cumberland	219.9	220.8	4,700	Agriculture	13.5
Dinwiddie	251.7	252.3	2,700	Forest	7.7
Dinwiddie	253.5	254.0	2,400	Open/Forest	6.9
AP-3 Lateral					
Southampton	20.6	20.8	870	Forest	1.5
Southampton	25.5	26.0	2,600	Agriculture	4.5
Southampton	31.8	32.6	4,200	Forest/Agriculture	7.2
Southampton	35.1	35.1	100	Agriculture (Tree Plantation) [b]	0.2
Southampton	38.2	38.3	600	Agriculture/Forest	1.0

[a] Identified in landowner letter filed under FERC accession no. 20170622-5088.

[b] Associated with the FIATP Timber, LLC c/o Forest Investment Associates, L.P. commercial tree farm, as listed in table 4.8.1-2.

Impacts on land enrolled in the Virginia Century Farms Program would be similar to that described for agricultural land above. Construction in agricultural land would result in temporary impacts and farming would be allowed to continue following construction. Construction in forest land would result in long-term impacts on areas cleared for the temporary construction right-of-way, which would be revegetated following construction except for the operational right-of-way, which would be maintained as open land and free of trees. ACP would permanently affect about 11 acres of tree plantations associated with agriculture land and forest land enrolled in the Virginia Century Farms Program. Atlantic would compensate the landowner(s) for project-related impacts on enrolled lands. Construction and operation of the project would not conflict with program participation requirements and, therefore, would not result in a significant or adverse effect on farms enrolled in the Virginia Century Farms Program.

Virginia Agriculture and Forestal Districts

Based on landowner consultations and comments received during scoping, ACP would cross one parcel within the Dutch Creek Agricultural and Forestal District between AP-1 MPs 173.1 and 173.6. Land use consists of 0.4 mile of forest land and 0.1 mile of open land; construction would affect about 30 acres of land. SHP is not located in Virginia and, therefore, it would not affect any Virginia Agriculture and Forestal District land.

In accordance with the Agricultural and Forestal Districts Act and per Code of Virginia, Section 15.2-4301, it is the policy of the Commonwealth of Virginia to "conserve and protect and to encourage the development and improvement of the Commonwealth's agricultural and forestal lands for the production of food and other agricultural and forestal products. It is also the policy of the Commonwealth to conserve and protect agricultural and forestal lands as valued natural and ecological resources which provide essential open spaces for clean air sheds, watershed protection, wildlife habitat, as well as for aesthetic purposes." Agriculturally and forestally significant land is land that has recently or historically produced agricultural and forestal products, is suitable for agricultural or forestal production, or is considered appropriate to be retained for agricultural and forestal production. The Agricultural and Forestal Districts Act provides a means by which any locality, upon landowner petition, can create agricultural and forestal districts (Commonwealth of Virginia, 1999). By establishing a district, property owners agree not to convert their farm, forestland, and other open space to more intense commercial, industrial, or residential uses for a term of 4 to 10 years. In return, the county and the Commonwealth agree not to take actions or make infrastructure investments that place increased pressure on landowners to convert land in the district to more intense land uses during the term of the district.

Within districts, land is eligible for use-value taxation as opposed to fair market value taxation. When land is removed from a district or the district is terminated, the owner must pay roll-back taxes for the difference between the tax that would have been paid on the land's fair market value and the special tax amount. The same rule applies to land that qualified for the special tax rate but was not part of a district if the land is subsequently developed to a more intensive use or rezoned to a more intensive classification at the request of the owner.

Based on comments received on the draft EIS from the Friends of Nelson, the ACP would permanently remove about 0.5 mile of mountain hardwood forest from timber production, and would parallel Falls Creek, which lies downslope from ACP as it flows to Dutch Creek, thence to the Rockfish and James Rivers to the Chesapeake Bay. We acknowledge that the permanent right-of-way would result in the conversion of forest land to open land. However, the landowner may choose to cultivate the converted open land as agricultural land and Atlantic would compensate the landowner for the loss of the trees. Areas outside of the permanent right-of-way would be able to continue within the pre-existing land use following construction. Operation of the project on the parcel would be of an equivalent or lower intensity than the activity it would replace and, therefore, would not result in a significant or adverse effect on agricultural and forestal lands enrolled as a Virginia Agriculture and Forestal District.

Agricultural Drain Tiles and Irrigation Systems

Based on information received to date (as of July 2016) as a result of Atlantic's and DETI's easement negotiations with landowners, drain tile and irrigation systems would be crossed at 22 locations along the AP-2 mainline and 7 locations along the AP-3 lateral. No known drain tiles or irrigation systems have been identified along the SHP route.

In agricultural areas, construction activities such trenching, grading, stringing, welding, and backfilling, could temporarily or permanently damage or interrupt drain tile or irrigation systems. Interruption to the flow of water for a prolonged period could damage crops and/or reduce crop yields. To reduce impacts on or avoid permanently impacting drain tile and irrigation systems, Atlantic and DETI would implement the following mitigation measures:

- Prior to construction, identify existing drain tile and irrigation systems and wells as part of landowner consultations and easement negotiations.
- Mark identified underground irrigation water pipes and well systems that intersect the construction area to alert the construction contractor's crews.
- Maintain the flow of irrigation water during construction or implement a temporary shut-off with the affected landowner(s).
- If construction activities damage a drain tile or irrigation system, mark the location immediately and implement temporary drain tile or irrigation system repairs within 48 hours to maintain the functionality of drainage systems during construction. Actions may include relocation, reconfiguration, or replacement of the existing tile lines.
- Repair the damaged tile line immediately and temporarily if water is still flowing until permanent repairs can be made.
- Compensate landowner(s) for crop losses resulting from system interruptions due to pipeline construction.
- Prior to backfilling the trench, employ a local (where available) qualified drain tile contractor to conduct permanent drain tile repairs.
- Make permanent drain tile line repairs within 20 days following the completion of construction, weather and soil conditions permitting.
- Repair the system to its former condition in a manner that assures the proper operating condition of the drain tile at the point of repair.
- Prior to completing repairs, examine the drain tile or irrigation system lines by suitable means on both sides of the trench for the entire length within the work area to check for tile that could have been damaged by construction equipment.
- Repair drain tile line with materials of the same or better quality as those damaged.

In addition to the above, as described in section 4.8.3, Atlantic and DETI would implement a Landowner Complaint Resolution Procedure to address issues associated with construction and restoration of the rights-of-way, which could include issues associated with soil restoration, crop production, irrigation, and drain tile systems. With the implementation of the above measures, construction-related impacts on drain tile and irrigation systems would be short term and minor.

Following restoration, Atlantic and DETI would coordinate with the affected landowner(s) to assess crop productivity and, if crop yields are declined, Atlantic and DETI would compensate the affected landowner(s). The amount of compensation and any additional mitigation measures would be based on the agreements and/or easement conditions with the affected landowner(s) or tenant(s). The pipeline would be installed with at least 4 feet of cover, which would be below the depth of most existing drain tile systems. If the drain tiles are deeper, 12 inches clearance would be established between the pipeline and drain tile system.

We conclude that implementation of the identified mitigation measures, including Atlantic's and DETI's commitment to identify and mark drain tiles and irrigation systems prior to construction and to repair any damaged by project-related activities, would minimize or mitigate the impacts of the project on drain tile and irrigation systems. Overall, construction activities would result in temporary impacts. Operation of the project would not adversely affect the continued functionally of drain tile and irrigation systems.

Forest Land

The effect of ACP and SHP would be greatest in forest lands, which includes hardwood and coniferous forests. Impacts on forest land would include the removal of trees within the construction right-of-way and at ATWS, aboveground facility sites, and new or modified access roads. Post-construction maintenance of the permanent right-of-way would prevent the reestablishment of trees, including orchards and tree crops (discussed in Agricultural Land). Table 4.8.1-1 lists the amount of forest clearing required for construction and operation of ACP and SHP, which is dependent on the width of the construction and permanent rights-of-way and the degree to which these areas overlap other existing cleared rights-of-way.

Following construction, forest land located outside of the permanent right-of-way, aboveground facility sites, and temporary access roads would be restored in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan*. It is expected that the reestablishment of forest areas that resemble preconstruction conditions would take at least 30 years, depending on the age of trees removed and the species of trees that are recruited or replanted. Forest restoration could take a century or more in areas that currently are mature or old-growth forests, and the fragmenting effects of the maintained right-of-way would be permanent. Compensation for tree loss would be determined during easement negotiations between the Applicants and the landowner.

The permanent right-of-way and aboveground facility sites would permanently impact forest land uses. The planting of trees within the permanent right-of-way would not be allowed to promote accessibility for maintenance and inspection, and for emergency response access. Maintenance activities would be conducted in accordance with Atlantic's and DETI's respective construction and restoration plans (see table 2.3.1-1). Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands would not be done more frequently than every 3 years. However, in accordance with the Atlantic's and DETI's *Restoration and Rehabilitation Plan* and to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state.

<u>Timber Removal</u>

The discussion below focuses on forest land harvested for ecological or commercial uses based on land ownership. In general, commercial timber harvest is any type of timber sale that produces merchantable wood products where the value of the product(s) usually is equal to or exceeds the direct cost of harvesting. ACP would cross forested lands that are managed for timber and owned by the FS (see section 4.8.9.1). State lands crossed by ACP that conduct timber harvesting include the James River WMA, which is managed by the VDGIF; and the Seneca State Forest, which is owned by WVDNR and managed by the WV State Parks and WV Division of Forestry. State lands crossed by SHP that conduct timber harvesting include the Lewis Wetzel WMA, which is managed by the WVDNR. While forest lands in the WMAs are not manage specifically for commercial purposes, timber harvesting can be implemented for habitat management and small timber sales may occur to create early successional habitat or enhance hard mast (tree nuts and seeds) production (WVDOF, 2010; VDGIF, 2016e).

Project-related impacts on harvested forest land and mitigation measures for these areas are discussed below. Project-related impacts on managed tree plantations and harvested forests where the land is re-established by shrub and grass/forb vegetation, and privately owned commercial tree farms that serve as a specialty crop, are discussed in the Agricultural Land section.

The degree of impact that would occur to forest and timber resources would depend on the logging methods used, quantity of lumber removed, and the age of affected stands. Timber cruises have not yet been conducted to determine the specific impacts associated with the projects. Atlantic and DETI would conduct timber cruises where requested by the landowner, including NFS lands, prior to construction. Therefore, for the purposes of this EIS, the assessment of the miles, acreages, and sizes of trees to be cleared within the pipeline construction and permanent rights-of-way was based on a desktop analysis using 2015 aerial photography and recent satellite photography.

Table 4.8.1-5 lists the estimated crossing lengths for late seral (i.e., mature forest at climax stage), mid-seral (i.e., younger forest in transition), and recently harvested forest lands. Recently harvested forest (i.e., within the last few years) included mature forests that have been selectively logged, and areas that have been heavily cleared or clear cut with no or little regrowth apparent or that had been replanted with seedlings or supporting up to knee–high saplings. Mid-seral stands were identified as generally ranging from thinner to full stands without evidence of logging roads and areas with noticeably shorter and younger trees. There is likely a large range of ages between the late and mid-seral forests.

TABLE 4.8.1-5

Recently Harvested, Early/Mid Seral, and Late Seral Forests Crossed by the Atlantic Coast Pipeline and Supply Header Project

Project/Facility	Recently Harvested Forest Crossed (miles)	Early/Mid-Seral Crossed (miles)	Late Seral Crossed (miles)
ATLANTIC COAST PIPELINE			
AP-1 Mainline	27.5	14.2	206.9
AP-2 Mainline	6.1	10.5	86.8
AP-3 Lateral	5.2	2.8	35.7
AP-4 Lateral	0.0	0.0	0.1
AP-5 Lateral	0.0	0.0	1.0
Subtotal	38.8	27.5	330.5
SUPPLY HEADER PROJECT	0.4	0.0	30.8
Projects Total	39.2	27.5	361.3

In determining impacts based on tree size, Atlantic and DETI used the following definitions to distinguish tree size: large trees were considered to be anything over roughly 50 feet in height with a mature spreading crown; medium trees were considered to be younger trees generally found in previously cut-over areas exhibiting even-age growth patterns and in plantation plantings specifically planted by or for forest products companies; and small trees were those located in fields or tree plantations that varied in height from small to large saplings. Table 4.8.1-6 lists the tree types that occur along ACP and SHP pipeline routes.

TABLE 4.8.1-6

Impacts on Forest Land by Tree Size Associated with the Atlantic Coast Pipeline and Supply Header Project

	Small Trees (acres)		Medium Trees (acres)		Large Trees (acres)	
Project/Facility	Within Temporary Workspace	Within Permanent Right-of-Way	Within Temporary Workspace	Within Permanent Right-of-Way	Within Temporary Workspace	Within Permanent Right-of-Way
ATLANTIC COAST PIPELINE						
AP-1 Mainline	283.5	161.7	434.0	244.7	3,274.7	1,832.9
AP-2 Mainline	70.3	35.1	245.0	125.8	919.0	469.5
AP-3 Lateral	33.8	21.0	83.0	50.1	305.8	189.9
AP-4 Lateral	0.0	0.0	2.9	1.4	0.0	0.0
AP-5 Lateral	8.5	5.2	1.1	0.7	4.4	2.7
Subtotal	396.1	223.0	766.0	422.7	4,503.9	2,495.0
SUPPLY HEADER PROJECT	0.0	0.0	0.0	0.0	410.7	186.7
Projects Total	396.1	223.0	766.0	422.7	4,914.6	2,681.7

A portion of the small to medium trees would not be merchantable (e.g., those less than 25 years in age). Future timber production would be lost on these young stands. The exact number and board feet of these non-merchantable trees would be determined during timber cruises. Operation of the pipeline would permanently affect about 2,405.8 acres of forest (see table 4.8.1-1), so this amount would be removed from the future timber base. This impact would be because trees would not be allowed to grow within the maintained easement within 15 feet of the centerline. This would include about 2,681.7 acres of large trees.

Atlantic and DETI would conduct timber cruises prior to vegetation clearing to determine timber volumes, values, and species composition within forested lands. In consultation with the land-management agency and landowner, Atlantic and DETI would develop site-specific logging plans for each area with merchantable timber to be logged, referred to as *Timber Extraction Plans*. These plans would identify the size, height, volume, and value of trees in each portion of the construction right-of-way; how the timber would be felled and yarded; where landings and log decks would be placed; and the haul routes that would be used to remove the logs. These plans would be completed prior to construction closer to when the temporary workspace limits are further refined. The FERC requires that all operations be contained within the certificated work area, so it is important to identify methods for falling, yarding, decking, and any additional temporary roads that may be needed for hauling logs prior to the start of construction. Logging methods would vary by location and would not be known until timber contractors evaluate site-specific conditions. The exact timber harvest and decking requirement locations would be determined by the contractor within the access roads and staging areas already approved for the pipeline.

Merchantable timber would be removed and sold according to current market value and based on stumpage board footage and tree species.

Clearing of forest is a two-step process: tree felling followed by yarding. Atlantic's *Timber Removal Plan* outlines four different scenarios that may be used to cut and remove timber from the right-of-way along the pipeline route, based on slope, stand density, and tree types: hand cutting, mechanical harvesting, high line yarder, and helicopter logging. Helicopter logging is not currently planned, but may be used in steep mountainous areas or if required by the land-managing agency. The FS would require that the *Timber Removal Plan* for NFS land include a transportation plan as any road use would require a commercial road use permit issued by the FS.

The specific logging methods would not be determined until after a contractor has been selected through the bidding process for each construction spread. Timber would be felled using the method best suited to terrain, permit conditions, and site-specific topographic conditions. Timber cutting can be done by mechanical means using tracked feller-bunchers or by hand methods with a chainsaw. Yarding can be done by cable where felled timber is removed with the use of cables and blocks using a tower (the yarder) and an anchor line. Yarding using a skyline system may also be used. This system requires a tailhold, which is the point of anchorage of the skyline. If a right-of-way alignment does not lend itself to be in-line for a good tailhold, the tailhold may need to be located outside of construction work areas. If tailholds are identified outside of the approved construction limits, Atlantic and DETI would have to seek approval from the FERC.

Atlantic expects that conventional clearing methods would be used where slopes are less than 30 percent using track and rubber tired equipment. In areas where slopes are greater than 30 percent, a combination of skyline clearing with yarders and yoders[14] would typically be used.

Some timber cleared from the right-of-way may be used for in-stream or upland wildlife habitat diversity structures. This timber would be stored on the edge of the right-of-way or in an ATWS for later use during restoration efforts. Prior to clearing operations, the EI would flag existing snags on the edges of the construction right-of-way or ATWS where feasible to save from clearing. These snags would be saved as and used to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians. During this process, other large-diameter trees on the edges of the construction right-of-way and ATWS would also be flagged to save/protect as green recruitment or habitat/shade trees, where feasible. Some of these trees would be girdled to create snags to augment the number of snags along the right-of-way to benefit cavity nesting birds, mammals, reptiles, and amphibians; however, snags that are determined to be a threat to worker safety would be removed.

Atlantic and DETI would perform all operations and tree felling within the certificated construction work area limits, and would fell or shear all trees within the certificated construction work area limits to prevent damage to adjacent trees, facilities, or structures. This may not be practical in steep areas where trees often must be felled on the contour to reduce breakage. Much of the forested portion of the route crosses steep mountainous areas. Failure to fall trees properly would result in a loss of timber available to local industries and loss of value to the landowners and land management agencies. Also, logging roads in some areas crossed by the pipeline have not been used in many years and are covered with young trees. These roads would require clearing and major reconstruction such as widening and regrading if needed for hauling logs.

Danger trees are those trees at risk of falling on workers or vehicles and thus would need to be removed for safety reasons. A tree may be at risk of falling for several reasons including the tree's location and the presence of defects, insects, disease, work activities, and weather conditions. Prior to tree clearing, Atlantic's and DETI's tree-clearing contractor would identify danger trees. Trees near any identified potential danger tree would be felled by hand prior to clearing activities. Additionally, danger trees could be created from trees felled for the pipeline. This would occur if trees outside of approved construction areas are damage during felling of harvested timber. If a danger tree is identified outside of the approved construction work areas and needs to be removed, Atlantic and DETI would seek the appropriate FERC

[14] A combination yarder/loader that can accomplish many of the same tasks as a yarding system on a smaller scale. Yoders can fill the gap for log removal in areas where alignment problems pose major inefficiencies to big yarders. These smaller yarding machines can effectively remove logs in tight, steep areas, such as those encountered in parts of the Appalachian Range.

and agency approvals prior to removing the tree(s). Atlantic and DETI would comply with OSHA standards when removing trees.

Atlantic and DETI would remove all slash and debris from the right-of-way by chipping and then hauling to an approved facility, burning on the right-of-way, or blowing it off the right-of-way, pending landowner approval and in accordance with permit regulations and agency consultations. In addition, Atlantic and DETI would make the chips from slash available for beneficial reuse as biomass fuel or paper production, where possible.

Where feasible, logs yarded out of wetlands or riparian zones would be skidded with at least one end suspended from the ground to minimize soil disturbance. Atlantic would remove any debris entering a waterbody because of felling and yarding of timber as soon as practical and place it outside the 100-year floodplain where practical. Logs and slash would not be yarded across perennial streams unless fully suspended. During logging/clearing operations, the direction of log or slash movement would be conducted to minimize sediment delivery to waterbodies, including intermittent streams. Logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber would not be disturbed, unless they prevent trenching and fluming operations. Any snags/logs within the pipeline trench during waterbody construction would be removed at the time of the crossing and set in adjacent, upland workspace. Where feasible and where pipeline integrity is not compromised, Atlantic would replace the log to its approximate original location. If the log is deteriorated, Atlantic may attempt to perform the replacement with a log of similar size. Special anchoring within the stream bank or cabling to weights would not be implemented, but rather the timber would be laid within the waterbody to approximate the natural recruitment of a falling tree across the waterbody. Replacement of timber below ordinary high water levels would only be conducted if the replacement is consistent with regulations and regulations under section 404 of the CWA.

Atlantic and DETI are consulting with the FWS, FS, and appropriate state/commonwealth agencies to determine mitigation and conservation measures for protected species, which may include guidelines for timber removal to benefit wildlife species. Measures specific to protected species are identified in the BA (ESA-listed species) (see section 4.7.1) and the BE (NFS lands) (see section 4.7.3).

Atlantic and DETI would implement the following measures to reduce impacts on timber:

- All tree felling and vegetation clearing would occur within the certificated construction work areas. If areas outside of the approved construction work areas are needed, Atlantic and DETI would seek the appropriate FERC and agency approvals prior to use.

- Danger trees would be felled in advance of pipeline construction clearing.

- Landings would not be located in wetlands or riparian areas, and, where feasible, logs yarded out of wetlands or riparian areas would be skidded with at least one end suspended from the ground to minimize soil disturbance.

- Logs and slash would not be yarded across perennial streams unless fully suspended over the stream and adjacent banks. Logs and slash may be hauled by truck over temporary bridges across waterbodies.

- Logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling timber would not be disturbed during logging and yarding operations unless they prevent trenching, fluming, or damming operations.

- Most timber removal would be accomplished through ground skidding and cable yarding; helicopter yarding may be used in some areas that are difficult to access. Where ground skidding is used, the following measures would be employed to minimize significant detrimental soil disturbance (compaction and displacement):
  - low ground weight (pressure) vehicles would be used;
  - the removal of soil duff layers would be avoided to maintain a cushion between the soil and the logs and the logging equipment;
  - designed skid trails would be used to restrict detrimental soil disturbance (compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area.
- In upland areas, stump removal would be limited to the trenchline and areas where grading is necessary to construct a safe, level working plane.
- Outside of the permanent pipeline easement, which would be kept clear of trees with roots that could compromise the integrity of the pipeline coating, the temporary construction area would be restored and revegetated using native seeds and saplings according to Atlantic's and DETI's *Restoration and Rehabilitation Plan*.
- After timber removal, temporary erosion control devices would be installed, inspected, and maintained in accordance with the Atlantic's and DETI's *Restoration and Rehabilitation Plan* and/or *Winter Construction Plan*, depending on the season and soil conditions.
- Atlantic, DETI, and their designated subcontractors would comply with West Virginia's Logging Sediment Control Act, Virginia's Seed Tree Law, and OSHA regulations, as applicable.

To reduce project-related impacts on merchantable timber suitable for timber production, Atlantic and DETI would implement their *Timber Removal Plan*. The plan describes how timber removal activities would be conducted; identifies measures for reducing impacts and stabilizing areas where timber is removed; and addresses compensation for loss of merchantable timber. Atlantic also developed an *Open Burning Plan* to outline procedures for burning vegetation along the right-of-way and a *Fire Plan* to outline BMPs for preventing fires and responding to inadvertent fires that occur during construction of the projects. We have reviewed Atlantic's and DETI's *Timber Removal Plan*, *Open Burning Plan*, and *Fire Plan* and find them acceptable on all lands except for NFS lands. A separate *Timber Removal Plan*, approved by the FS, are required on all NFS lands and would be included with the *COM Plan*. In addition, to avoid potential adverse impacts on wildlife and wildlife habitat, the FS has recommended no burning on NFS lands. Large woody debris from cleared vegetation and stumps would be placed along the edge of the right-of-way to minimize the potential for soil erosion and sedimentation. The material would be placed in a manner that would not impede natural drainage, and gaps would be left at intervals to provide passage for wildlife and human uses on NFS land. If any cleared vegetation must be chipped on-site, Atlantic would haul chips off the right-of-way to a disposal site off NFS land. Atlantic will work with the FS to finalize the *COM Plan* with this requirement. Section 4.8.9.1 further discusses impacts on NFS lands.

We received comments on the draft EIS from the VDEQ regarding the *Timber Removal Plan* requesting that the following mitigation measures be added to the plan:

- Section 3.0: Training shall be related to each location in accordance with all applicable federal, state, and local laws and regulations pertaining to the removal of timber.

- Section 9.1: All slash, chips, and debris shall be managed in accordance with all applicable federal, state, and local laws and regulations.

- General: Open burning in Virginia is only allowed in accordance with 9VAC20-81-95 of the Virginia Solid Waste Management Regulations. Localities may have additional open burning restrictions and should be consulted.

We agree with the VDEQ's additions and clarifications to the plan. Also, the *Timber Removal Plan* includes a discussion of the construction schedule (section 1.0) and TOYR related to migratory birds and special status species (section 7.0), which have both changed since issuance of the draft EIS. Therefore, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, a final *Timber Removal Plan* that:**

  a. incorporates the recommendations included in the VDEQ's letter dated April 6, 2017 (Accession No. 20170406-5489);

  b. updates the construction schedule discussion; and

  c. updates all TOYR related to migratory birds and special status species for tree clearing.

As discussed above, Atlantic and DETI are currently preparing their *Timber Extraction Plans*, which are pending right-of-way negotiations and timber cruises. Therefore, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval by the Director of OEP, finalized site-specific *Timber Extraction Plans*.**

Also, based on recommendations for mitigation from the VDOF, Atlantic developed the following measures to be implemented in forest land on VDOF-owned land. These measures are in addition to those described in its *Restoration and Rehabilitation Plan*, and other construction and restoration plans (e.g., *Invasive Plant Species Management Plan*) (see table 2.3.1-1).

- To the extent feasible, and relative to safety and reasonable construction practices and efficiencies, attempt to use machinery that weighs less than 10 tons per axle to minimize compaction impacts on soils.

- Traffic lanes for transporting cleared timber from the construction site would be kept to the minimum necessary for efficient transportation of haul logs from the right-of-way.

- Review water quality as outlined by the VDOF's voluntary BMP guidelines for harvesting operations, and incorporate those that are consistent with clearing/construction practices for large-diameter linear pipeline construction. Atlantic would coordinate with the VDOF on these BMPs.

- Consider establishing non-tree woody plants that are considered desirable ground cover and wildlife habitat along the edge of the permanent, maintained easement.

We note that Atlantic has also been consulting with the VDGIF regarding timber values, the process for removing timber on state land, and construction and timber removal timing.

We conclude that implementation of the identified mitigation measures, including implementing Atlantic's and DETI's *Timber Removal Plan*, *Open Burning Plan*, and *Fire Plan*, would minimize the impacts of the project on harvested forests on state land to the extent practicable and would not be significant or adverse.

Developed Land

Developed land consists of commercial/industrial areas (e.g., businesses, golf course), roads, and residential areas such as single-family housing units, apartment complexes, and row houses. Residential land as a subset of this land use type consists of approximately 50 percent of the AP-1 mainline and AP-2 mainline, and approximately 75 percent of the AP-3 lateral. Access to residences and businesses would be maintained and affected landowners would be coordinated with by the Applicants on an individual basis. Section 4.8.3 discusses further project-related impacts on existing and planned residential and commercial areas.

Project-related impacts on roads would be temporary to short term and minor. As discussed in section 2.3.3.8, most paved roads and railroads would be crossed by the bore method, and unpaved roads would be crossed using the open-cut method. Roads would remain open, a detour would be established, or one lane of traffic would be kept open. A temporary bridge or bypass may be established on small roads or driveways where necessary to maintain access to residences, public buildings, or businesses, or where otherwise required. Atlantic and DETI would implement the traffic control measures described in their *Traffic and Transportation Management Plan*.

Impacts on roads resulting from construction could result in soil or mud on roadways and road damage due to heavy equipment use. To minimize these impacts, Atlantic and DETI would remove excess soil or mud tracked onto roadways as soon as practicable; install sediment barriers at the base of slopes adjacent to roads to prevent sediment from the construction right-of-way from being washed onto roads during rain events; and cross paved roads on a combination of rubber mats, tires, and/or plywood sheets to prevent damage to roads. On FS roads, operations should be conducted in a manner that soil or mud is not tracked onto roadways due to heavy equipment use. Following construction, roads crossed using the open-cut method would be restored to preconstruction conditions and Atlantic and DETI would work with the local transportation authority to address road repairs. New, permanent employees traveling to the project area during operations would result in negligible impacts on roads or railroads (see section 4.9.6).

Open Land

Open lands that would be affected by the pipeline project include open fields; existing utility rights-of-way; herbaceous and scrub-shrub uplands; beach and shore lands; and cliff, canyon, and talus lands. Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Impacts on open land would be temporary and short-term and would be minimized by the implementation of Atlantic's and DETI's *Restoration and Rehabilitation Plan*. Following construction, most open land uses would be able to continue. However, some activities, such as the building of new commercial or residential structures, would be prohibited on the permanent right-of-way. Operation of the project would result in negligible impacts on open land.

4.8.1.2 Aboveground Facilities

Construction of new aboveground facilities for ACP and SHP would result in minor to moderate and temporary to permanent impacts on land use as a result of site clearing and facility installation activities at each site. Modifications at existing aboveground facilities that require workspace outside of the facility site would result in similar impacts. Following construction, temporary workspace not required for operation of the aboveground facility at each site would be restored in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan* and any agency requirements. Operation of new aboveground facilities and expansion of existing aboveground facilities would result in minor and permanent impacts on land use as a result of converting the existing land use to developed land. Table 4.8.1-1 lists the land use impacts associated with Atlantic's and DETI's aboveground facilities.

As described in section 2.1.2.6, ACP would require 26 communication towers to facilitate system communications during operation of the project (see table 2.1.2-6). Of these, 10 would be installed within or immediately adjacent to proposed compressor station, M&R station, and valve sites; the remaining towers would be associated with existing sites. A typical communication tower site would require 0.1 acre of land that is graded and finished off with crushed stone and enclosed by a chain link fence. Most sites would occur on agricultural or forest land (see table 4.8.1-1).

4.8.1.3 Contractor Yards

To support construction activities, Atlantic would use a total of 24 contractor/pipe storage yards and DETI would use a total of 11 contractor/pipe storage yards on a temporary basis. As listed in table 4.8.1-1, yards would temporarily affect mixed land uses that have been previously disturbed and cleared, except for five yards that would affect forest/woodland. Where possible, Atlantic and DETI would avoid cutting existing trees at the proposed contractor yards. Also, Atlantic and DETI would maintain a buffer around wetlands and waterbodies, and would develop sediment and erosion control plans for each contractor yard to promote avoiding adverse impacts on wetland and waterbodies at the yards. Following construction, these areas would be restored in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan* or as requested by the landowner or land-managing agency. Project-related impacts on land uses at contractor yards would be minor and temporary.

4.8.1.4 Access Roads

While public roads and the construction right-of-way would be used for primary access to project workspaces, Atlantic would improve, build, and/or maintain access roads for construction and operation of the projects (see appendix E). On FS roads, a commercial road use permit would have to be requested and issued to authorize any commercial use of a FS road, whether during construction and/or operation phases. Table 4.8.1-1 summarizes by state the impacts on land use associated with access roads. Construction and operation of temporary access roads would result in minor to moderate and temporary impacts on land uses. Following construction, these areas would be restored in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan*. Temporary access road improvements would be removed and roads restored to their preconstruction condition unless the landowner or land-managing agency requests that the improvements be left in place. To restore the roads, the areas outside the original road footprint would be recontoured and disturbed areas would be reseeded with an appropriate seed mix unless otherwise requested by the landowner or land-managing agency. Appendix E identifies each road improvement proposed on the projects.

We received comments on the draft EIS requesting additional information about how Atlantic would accommodate construction equipment and vehicles on public roads where the road is narrower than that previously discussed as needed to accommodate equipment (30 feet), located in steep terrain, etc. and that no improvements have been identified by Atlantic.

Atlantic would address transportation of equipment, materials, and personnel in a separate *Haul Plan*, which would supplement the *Traffic and Transportation Management Plan*. According to Atlantic, narrow public roads in steep terrain may require the use of pilot cars, flaggers, and temporary lane closures to cross select locations. Atlantic's *Haul Plan* is currently being developed. Therefore, **we recommend that:**

- **As part of its Implementation Plan (recommended Environmental Condition No. 6), Atlantic should file a final copy of its *Haul Plan*, which would address transportation of equipment, materials, and personnel along narrow public roads in steep terrain.**

We received comments on the draft EIS requesting additional details regarding improvements required along proposed access roads to accommodate construction equipment. Appendix E has been updated to list the improvements needed for access roads. The FS stated the effects on NFS lands of transportation of equipment, materials, and personnel cannot be fully assessed until receipt of the *Haul Plan*.

4.8.1.5 Cathodic Protection

Cathodic protection systems help prevent corrosion of underground facilities. These systems typically include a small, aboveground transformer-rectifier unit and an associated anode groundbed located on the surface or underground. Cathodic protection facilities are typically located within the pipeline right-of-way, although Atlantic and DETI identified locations where groundbeds would extend off the pipeline right-of-way for a short distance due to local geologic conditions. Following installation of these facilities, the disturbed area would be restored and operated similarly to the pipeline right-of-way. Table 4.8.1-1 summarizes by state the impacts on land use associated with groundbed cathodic protection.

4.8.2 Land Ownership and Easement Requirements

Pipeline operators must obtain easements from landowners and land-managing agencies to construct and operate natural gas facilities, or acquire the land on which the facilities would be located. Easements can be temporary, granting the operator the use of the land during construction (e.g., for temporary workspace, access roads, yards); or permanent, granting the operator the right to operate and maintain the facilities after construction. Atlantic and DETI would need to acquire long-term easements and/or special use permits to construct and operate the new project facilities. These authorizations would convey temporary and permanent or long-term rights-of-way to Atlantic and DETI for construction and operation of the proposed facilities. Table 4.8.2-1 summarizes public land ownership affected by ACP and SHP. No tribally owned or reservation land would be crossed or affected by the projects. For a breakdown of each federal land area affected, see section 4.8.9 and table 4.8.9-1.

An easement agreement between a company and a private landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction. The easement would give the company the right to construct, operate, and maintain the pipeline, and establish a permanent right-of-way. Landowners would be compensated for the use of their land through the easement negotiation process.

TABLE 4.8.2-1 **Summary of Land Ownership for the Atlantic Coast Pipeline and Supply Header Project**			
Ownership		Crossing Length (miles)	Percent of Total Project Length
ATLANTIC COAST PIPELINE			
Federal Lands			
NPS		0.1	<0.1
FS		21.2	3.5
	Subtotal	21.3	3.5
State/Commonwealth Lands			
West Virginia		4.8	0.8
Virginia		1.2	0.2
North Carolina		<0.1	<0.1
	Subtotal	6.1	1.0
Municipal Lands			
Virginia		<0.1	<0.1
	Subtotal	<0.1	<0.1
Private Lands			
West Virginia		88.7	14.7
Virginia		289.9	47.9
North Carolina		198.7	32.9
	Subtotal	577.3	95.5
PROJECT TOTAL		604.5	100.0
SUPPLY HEADER PROJECT			
State/Commonwealth Lands			
West Virginia		3.7	10.0
	Subtotal	3.7	10.0
Private Lands			
West Virginia		29.8	79.5
Pennsylvania		3.9	10.4
	Subtotal	33.7	90.0
PROJECT TOTAL		37.5	100.0

We received several comments expressing concern that landowners would not be compensated for easements obtained via the condemnation process. If an easement cannot be negotiated with a landowner and the project has been certificated by the FERC, the company may use the right of eminent domain granted to it under section 7(h) of the NGA and the procedure set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the right-of-way and extra workspace areas. The company would still be required to compensate the landowner for the right-of-way and for any damages incurred during construction. However, a court would determine the level of compensation if a Certificate is issued. In either case, the landowner would be compensated for the use of the land. Eminent domain would not apply to lands under federal ownership. The easement process for federal lands is discussed in sections 2.2.1and 4.8.9.

We received several comments regarding the legality of the use of eminent domain. Commenters argue that the applicability of "public good" or "public use" for determining a project's need and granting an Order, along with the right of eminent domain, to for-profit industries is a misinterpretation of eminent domain laws. A project's need is established by the FERC when it determines whether a project is required by the public convenience and necessity (i.e., the Commission's decision is made). The FERC's Certificate Policy Statement provides guidance as to how the Commission evaluates proposals for new construction, as discussed below, and establishes criteria for determining whether there is a need for a proposed project and whether it would serve the public interest.

The Commission's analysis of whether a proposed project is in the public good and required by the public convenience and necessity consists of three steps. The Commission's Statement of Policy on the Certification of New Interstate Natural Gas Pipeline Facilities[15] explains that in deciding whether to authorize the construction of major new pipeline facilities, the Commission must first balance the public benefits against the adverse effects on specific economic interests. If the conclusion is that the public benefits would not outweigh the adverse effects on the economic interests, the Commission would deny the proposal. If, however, the conclusion that the public benefits do outweigh the adverse effects on the economic interests, the Commission next takes a "hard look" at potential environmental impacts of the proposed action under the requirements of the NEPA. If the Commission finds the potential environmental impacts to be unacceptable, it would deny authorization. If, however, the Commission determines that, based on the environmental analysis and consideration of all comments submitted, the proposed project can be constructed and operated in an environmentally acceptable manner, the Commission may issue an Order that finds the project is required by the public convenience and necessity. That Order would contain the environmental conditions the Commission deems necessary and appropriate to ensure acceptable mitigation of potential environmental harms.

Congress, through the NGA, has established eminent domain for interstate natural gas pipelines. Congress could evaluate the "legality" of eminent domain or consider revisions to eminent domain law under the NGA, with judicial oversight. This EIS cannot serve as the venue for evaluating the legality of eminent domain law.

In summary, if the Commission finds a proposed project to be environmentally unacceptable based on Commission staff-prepared NEPA documents, the Commission would not approve the project. If the Commission finds the project to be environmentally acceptable based on the NEPA documents, the Commission may approve it, typically with conditions, provided it is otherwise required by the public convenience and necessity. The use of eminent domain under federal law is only conveyed to an applicant once the Commission issues an Order.

4.8.3 Existing Residences and Commercial and Industrial Facilities

Based on a review of recent aerial photography and Atlantic's and DETI's civil surveys, residences and structures within 50 feet of construction work areas are listed in table 4.8.3-1.

We received comments expressing concern that the projects would damage property and property values; prevent access to and the use of residential, community, and commercial buildings; and disrupt telephone, cable, and power lines. In residential areas, the most common impacts associated with constructing and operating a pipeline are temporary disturbances during construction and the existence of the permanent right-of-way, which would prevent the construction of permanent structures within the right-of-way. Temporary construction impacts on residential areas would include inconveniences caused by noise and dusts; disruption to access of homes; traffic congestion; ground disturbance of lawns and visual character caused by removal of trees, landscaped shrubs, or other vegetation screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells and other utilities; and removal of aboveground structures such as fences, sheds, playgrounds, or trailers from within the right-of-way. Impacts on property values are discussed in section 4.9.7.

[15] The Policy Statement can be found on our website at http://www.ferc.gov/legal/maj-ord-reg/PL99-3-000.pdf. Clarifying statements can be found by replacing "000" in the URL with "001" and "002."

TABLE 4.8.3-1

Residences and Commercial Structures within 50 Feet of the Construction Work Areas Associated with the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/County or City, State or Commonwealth	Milepost	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)
ATLANTIC COAST PIPELINE			
AP-1 Mainline			
Lewis, WV	8.4	48	183
Lewis, WV	8.5	35	120
Upshur, WV	41.3	26	162
Upshur, WV	41.4	21	106
Randolph, WV	45.3	32	122
Pocahontas, WV	76.5	15	65
Highland, VA	88.4	24	109
Augusta, VA	112.0	15	70
Augusta, VA	130.5	28	155
Augusta, VA	131.6	35	123
Augusta, VA	131.7	37	172
Augusta, VA	149.7	49	86
Nelson, VA	169.0	32	132
Nelson, VA	169.4	30	120
Cumberland, VA	213.3	20	104
Cumberland, VA	213.5	38	199
Cumberland, VA	215.8	15	143
Cumberland, VA	219.8	31	192
Nottoway, VA	235.6	15	105
Nottoway, VA	237.2	37	172
Dinwiddie, VA	255.9	44	179
Dinwiddie, VA	255.9	15	171
AP-1 Subtotal (no. of residences)	22		
AP-2 Mainline			
Halifax, NC	13.6	39	114
Nash, NC	43.5	48	123
Nash, NC	46.5	28	118
Nash, NC	59.7	38	98
Wilson, NC	68.9	39	99
Wilson, NC	71.6	46	106
Johnston, NC	83.9	32	153
Johnston, NC	113.6	20	120
Sampson, NC	115.0	46	150
Sampson, NC	116.2	43	143
Cumberland, NC	126.4	19	118
Cumberland, NC	134.6	42	115
Cumberland, NC	135.1	30	90
Cumberland, NC	159.3	16	82
Robeson, NC	175.0	16	78
Robeson, NC	180.8	44	119
AP-2 Subtotal (no. of residences)	16		
AP-3 Lateral			
Southampton, VA	16.0	30	55
Southampton, VA	16.4	15	40
City of Suffolk, VA	61.9	15	41
City of Chesapeake, VA	77.6	34	59

TABLE 4.8.3-1 (cont'd)

Residences and Commercial Structures within 50 Feet of the Construction Work Areas Associated with the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/County or City, State or Commonwealth	Milepost	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)
City of Chesapeake, VA	77.8	47	70
City of Chesapeake, VA	77.8	39	64
City of Chesapeake, VA	79.1	11	36
City of Chesapeake, VA	79.1	13	38
City of Chesapeake, VA	79.1	15	29
City of Chesapeake, VA	79.1	20	54
City of Chesapeake, VA	79.1	38	73
City of Chesapeake, VA	79.1	47	82
City of Chesapeake, VA	79.2	15	49
City of Chesapeake, VA	79.2	33	68
City of Chesapeake, VA	79.3	29	63
City of Chesapeake, VA	79.3	15	34
City of Chesapeake, VA	79.3	15	31
City of Chesapeake, VA	79.3	27	52
City of Chesapeake, VA	79.9	15	49
City of Chesapeake, VA	80.0	22	47
City of Chesapeake, VA	80.0	30	55
City of Chesapeake, VA	80.1	20	45
City of Chesapeake, VA	80.1	18	43
City of Chesapeake, VA	80.1	28	53
City of Chesapeake, VA	80.1	29	54
City of Chesapeake, VA	80.1	32	57
City of Chesapeake, VA	80.2	33	58
City of Chesapeake, VA	80.2	30	55
City of Chesapeake, VA	80.2	17	42
City of Chesapeake, VA	80.2	28	53
City of Chesapeake, VA	80.2	34	59
City of Chesapeake, VA	80.2	20	45
City of Chesapeake, VA	80.2	22	47
City of Chesapeake, VA	80.3	26	51
City of Chesapeake, VA	80.3	15	28
City of Chesapeake, VA	80.3	25	50
City of Chesapeake, VA	80.3	23	48
City of Chesapeake, VA	80.3	23	48
City of Chesapeake, VA	80.3	48	73
AP-3 Subtotal (no. of residences)	39		
Atlantic Coast Pipeline Total	77		
SUPPLY HEADER PROJECT			
TL-636 Loopline			
Westmoreland, PA	1.4	17	51
Westmoreland, PA	1.4	42	142
Westmoreland, PA	3.4	17	55
TL-636 Subtotal (no. of residences)	3		
TL-635 Loopline			
Doddridge, WV	12.6	29	129
Doddridge, WV	15.2	15	59
TL-635 Subtotal (no. of residences)	2		
Supply Header Project Total	5		

Atlantic and DETI would use special construction methods designed for working in residential areas. These special construction methods are described in section 2.3.3, and specific methods to be used on certain individual properties are shown on Atlantic's and DETI's site-specific *RCPs*. In addition to the residential construction methods described in their respective *Plans*, Atlantic and DETI would implement the following general measures to minimize construction-related impacts on all residences located within 50 feet of the construction right-of-way:

- avoiding the removal of trees and landscaping unless necessary to construct the proposed pipelines or for the safe operation of construction equipment;
- installing and maintaining construction fencing at the edge of the construction work area and at least 15 feet from the residence for 100 feet on either side of the residence, and maintaining fencing throughout the open-trench phase of pipe installation;
- notifying the landowner 1 week prior to construction on his/her property;
- limiting construction to daylight hours;
- where the construction corridor crosses roads necessary for access to private residences and no alternative entrance exists, implementing measures (e.g., plating over the open portion of the trench) to maintain passage for landowners and emergency vehicles
- developing and implementing site-specific traffic control plans to limit heavy construction traffic in sensitive areas to specific times of day and/or limiting the types of equipment used in these areas to the extent practicable;
- mitigating noise/vibration impacts when HDDs are anticipated to exceed acceptable noise thresholds near businesses or residents by implementing measures such as installing sound attenuation structures and/or surrounding drilling equipment with earth berms;
- where the pipeline centerline is within 25 feet of a residence, waiting to excavate the trench until the pipe is ready for installation;
- completing temporary repairs to septic systems within 48 hours of damage and completing permanent repairs before final restoration; and
- restoring lawns and landscaping within construction work areas immediately after backfilling the trench.

Atlantic and DETI prepared site-specific *RCPs* for most of the residential buildings currently identified as within 50 feet of construction work areas (see appendix J). Atlantic's and DETI's site-specific *RCPs* include measures to minimize disruption and ensure access to the residences within 50 feet of the construction work areas. These construction plans include a dimensioned drawing depicting the residence in relation to the pipeline construction; workspace boundaries; the proposed permanent right-of-way; and other nearby residences, structures, roads, and miscellaneous features (e.g., other utilities, playgrounds, catch basins, sewers). We have reviewed the site-specific *RCPs* and find them acceptable.

After issuance of the draft EIS, Atlantic identified one additional residence within 50 feet of the construction workspace at AP-1 MP 169.4 (see table 4.8.3-1). However, a site-specific crossing plan was not provided. Therefore, **we recommend that:**

- **<u>As part of their Implementation Plans (recommended Environmental Condition No. 6)</u>, Atlantic and DETI should file with the Secretary, for review and written approval**

by the Director of OEP, final site-specific *RCPs* for all residences within 50 feet of the construction work areas identified after issuance of the draft EIS (including the residence at AP-1 MP 169.4).

Atlantic and DETI would be responsible for monitoring and ensuring compliance with all environmental mitigation measures required by the FERC Certificate, if the project is approved. Our experience has shown that when project sponsors maintain communication with landowners during construction and restoration phases, issues in and near residential areas can be effectively managed and resolved. Landowners would be able to contact Atlantic or DETI if they have any concerns or issues during the construction period. To ensure impacts on residences are addressed, Atlantic and DETI have prepared a Landowner Complaint Resolution Procedure. Atlantic and DETI would send a letter to each landowner affected that would provide a telephone contact for questions or concerns and provide a timeframe in which an Atlantic or DETI representative would respond. In the event Atlantic's or DETI's response is not satisfactory to the landowner, the letter would also identify the FERC's Landowner Helpline contact information. The procedure would be in effect for 2 years after construction. We have reviewed this procedure and find it acceptable.

Operational impacts would be limited to the approximately 100 acres of residential lands located within the permanent right-of-way, which would have some level of restricted use. Specifically, permanent structures would not be permitted within the permanent right-of-way.

We conclude that with implementation of Atlantic's and DETI's mitigation measures, including the construction methods in residential areas, its site-specific *RCPs*, and Landowner Complaint Resolution Procedure, impacts on residences would be minimized or mitigated.

4.8.4 Planned Developments

Based on Atlantic's and DETI's consultations with county and local planning agencies and comments received during scoping, ACP would be located within 0.25 mile of 11 known planned developments; SHP would not be located within 0.25 mile of any known planned developments. Known planned developments are listed in table 4.8.4-1.

Two of the identified planned developments (Co-Part Auto Auction Expansion and W.L. Black and Associates Waste Transfer) would be within 0.25 mile of ACP but not affected by the construction workspace; therefore, no direct impacts would occur and conflicts with the development as a result of the project are not anticipated. Details such as facilities, site layouts, and timing are unknown for two other planned developments (Greensville Power Station and future stormwater improvements to existing system between the Colony Manor area and stormwater facility). In addition, one development (Red Top Raw Water Main) would be adjacent to the project and project workspace could overlap with the workspace required to construct the development. The AP-3 lateral would be adjacent to the proposed water pipeline project north of Highway 58, which could be constructed in phases over the next several years. Atlantic has obtained design information on the project from the City of Chesapeake. Atlantic would continue to coordinate with the developers and permitting authorities to verify the status of each project, verify schedule, and identify and address any potential construction-related impacts.

The following summarizes the identified planned developments crossed by or near ACP.

TABLE 4.8.4-1

Known Planned Developments within 0.25 Mile of the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Facility/ County or City, State or Commonwealth	Name of Planned Development	Begin Milepost	End Milepost	Crossing Length (feet)	Development Type and Status [b]
ATLANTIC COAST PIPELINE					
AP-1 Mainline					
Augusta, VA	Stone Valley Planned Unit Development	145.9	146.1	1,100	Mixed use including townhouse and single family residential lots. Project avoids subdivision plats; owner agrees with route location.
Nelson, VA	Wintergreen Resort	159.0	160.0	N/A	Luxury hotel. Project would cross road entering proposed resort; resort would be about 1 mile east of project. Consultations ongoing.
Nelson, VA	Spruce Creek Resort and Market	162.4	162.7	N/A	Hotel, restaurant, and public market. Consultations ongoing.
Greensville, VA	Greensville Power Station – road improvements and utilities	284.0	285.0	Unknown	Utility lines and roads. Details currently unknown but likely to be crossed at various locations by AP-1 and AP-4.
AP-2 Mainline					
Nash, NC	Bone Development, Inc.	50.8	51.0	1,100	Residential. Owner agrees with route location.
Wilson, NC	TR Lamm Subdivision	67.8	68.0	1,100	Residential. Owner provisionally agrees with route location.
Cumberland, NC	McClauren Subdivision	131.6	132.2	2,800	Residential. Consultations ongoing.
AP-3 lateral					
City of Chesapeake, VA	Red Top Raw Water Main	68.9	71.3	<0.1	Water main. Development would be parallel and adjacent to project.
City of Chesapeake, VA	Future connection between Colony Manor and future regional stormwater facility	76.0	76.0	Unknown	Stormwater drainage improvements. Development design in progress. Details currently unknown.
City of Chesapeake, VA	Co-Part Auto Auction Expansion	76.6	76.6	N/A	Commercial lot expansion. Development would be located about 0.1 mile north of project and on opposite side of railroad.
City of Chesapeake, VA	W.L. Black and Associates Waste Transfer	78.6	78.6	N/A	Commercial waste water transfer building/facility. Development would be located about 0.1 mile north of project.
SUPPLY HEADER PROJECT					
No known planned developments					

[a] Counties and cities crossed by the projects not listed indicate that no known planned developments were identified during Atlantic's and DETI's consultations with local planning agencies.

[b] Based on Atlantic's and DETI's consultations with the local planning agency or developer and comments received during scoping as of September 2016.

4.8.4.1 Stone Valley Planned Unit Development

The Stone Valley Planned Unit Development is a mixed-use planned development in Augusta County, Virginia. Atlantic's AP-1 mainline would cross about 1,100 feet of the area beginning at MP 145.9. The development would include about 247 townhouse lots and 128 single family residential lots off U.S. 340 in Stuarts Draft. Based on comments received on the draft EIS from the Augusta County Board of Supervisors, the project could reduce the overall number of lots by 18 to 30. Per the VDEQ's stormwater permitting database, the estimated completion date of the development project is February 2018. It is possible that construction of ACP could conflict with the planned development. If construction dates were to overlap, conflicts with the developer's planned construction activities at this site could occur on a temporary basis. Based on Atlantic's consultations, the proposed route through the planned development area is agreeable to the developer. However, based on comments from the August County Board of Supervisors, the compensatory agreement offered by Atlantic has not been agreeable to the developer.

Consultations between Atlantic and the developer are ongoing. As described in section 4.8.2, Atlantic must obtain an easement from a landowner to construct and operate natural gas facilities, or acquire the land on which the facilities would be located. If an easement cannot be negotiated with a landowner and the project has been certificated by the FERC, the company may use the right of eminent domain granted to it to obtain the right-of-way and extra workspace areas. The company would still be required to compensate the landowner for the right-of-way and for any damages incurred during construction. However, a court would determine the level of compensation if a Certificate is issued.

4.8.4.2 Wintergreen Resort

We received comments that the project would preclude the development of a luxury hotel at Wintergreen Resort. Concerns include blocking access along the road leading to the resort area, adversely affecting the view shed, and preventing future development and sale of lots. The hotel would consist of 150 rooms and is estimated to produce $8.5 million to $12 million in annual revenues and 150 permanent, full-time jobs, plus seasonal jobs (Friends of Wintergreen, 2016). Based on information from the developers, Wintergreen Pacific LLC and Pacific Group Resorts, they "would be forced to discontinue development of [the] hotel, or substantially delay its development" if ACP is constructed (Friends of Wintergreen, 2016). Based on information provided by Wintergreen Property Owners Association Inc. and Wintergreen Resort Inc., the proposed hotel within the Wintergreen Resort area would be over 1 mile east of the project near AP-1 MPs 159.0 to 160.0 where existing homes and businesses are most prevalent and near ski slopes.

Most comments received expressed concern about crossing roads accessing the proposed and existing resort area. The project would cross Beech Grove Road and State Highway 664, which provide entry to the proposed Wintergreen Resort area at AP-1 MPs 158.6 and 158.8, respectively. Atlantic would cross Beech Grove Road using the HDD method in association with the proposed BRP crossing; the road would remain open to traffic throughout construction. Atlantic would cross State Highway 664 using the bore method, which also would allow for the road to remain open to traffic throughout construction. Atlantic would also cross Fortunes Ridge Lane at AP-1 MP 159.4 using the open-cut method. The road ends east of the pipeline crossing, provides private access to a few residences located beyond the pipeline crossing, and provides no outlet to other roads. Atlantic would install materials, such as steel road plates, to maintain continued ingress/egress along Fortunes Ridge Lane for residents during construction. Construction activities at these locations would take about 14 months to complete.

We received comments on the draft EIS expressing concern about the amount of time to complete construction in the Fortune's Point area. We acknowledge that pipeline construction in steep slope areas may take longer than construction in flatter terrain.

Concerns were also received regarding pipeline safety and the potential economic loss to the area should the Wintergreen Resort development be discontinued as a result of the project. These concerns are addressed in sections 4.9.8 and 4.12.1.

We analyzed several route variations (e.g., South of Highway 664 Route Alternative, Alternative 28) that would avoid the greater Wintergreen Resort area. For the reasons discussed in section 3.3.7 and 3.3.9, we find that the alternatives would not provide a significant environmental advantage over the proposed route and do not recommend that the route variations be incorporated as part of the project.

We believe that construction of ACP and development of the hotel could be accomplished such that impacts associated with ACP are reduced or mitigated for, while maintaining the appeal of the area, as demonstrated by other residential and commercial developments in the area and similar projects throughout the country.

4.8.4.3 Spruce Creek Resort and Market

We received comments that ACP would preclude the development of the Spruce Creek Resort and Market, a proposed five-star destination resort, hotel, restaurant, and public market on 100 acres of mature woodland along Virginia State Route 151 and bisected by Spruce Creek (Friends of Wintergreen, 2016; Averitt, 2015; Rockfish Valley Investments, 2016). More specifically, the developer is concerned that the project would cross the middle of the property, eliminate the attractiveness of the resort area and, thus, development of the resort would be stopped. Based on information provided by the developer, the AP-1 mainline would cross the resort between approximate MPs 162.4 and 162.7 in Nelson County, Virginia.

The northern half of the planned resort property would consist primarily of cottages and dining areas; the southern half would consist of additional cottages, a banquet hall, parking, reception and maintenance buildings, and a market and shops (Nelson County Department of Planning and Zoning, 2016). The developer had submitted a SUP application to Nelson County and, following a January 5, 2016 Nelson County Board of Supervisors meeting, the project was approved (Horizons Village, 2016).

We received comments on the draft EIS from the Spruce Creek Resort and Market developer that provided additional details about the development and how ACP would impact the area. While this information was previously provided, it was labeled by the developer as “confidential” and “privileged” and, as such, we were unable to convey these details in a public document. The information provided in response to the draft EIS by the developer was filed as public and is summarized below.

Based on figures provided by the developer, ACP would cross an area that would be occupied by seven treehouses, five spa cabins, and a main reception and boutique (Rockfish Valley Investments, 2017). The treehouses have been designed “for this geographic location due to the slope, the existing tree canopy and the opportunity to have them positioned to each be secluded and enjoy a private view down the hill onto the lush wetland area along Spruce Creek” (Rockfish Valley Investments, 2017). The cabins and other buildings have been designed to “preserve and celebrate the existing wetland character and experience…to allow for the natural sound of the running water and the wildlife to enhance the experience of tranquility” (Rockfish Valley Investments, 2017). According to the developer, the Spruce Creek Resort and Market would physically lose more than 30 percent of its planned accommodations and the entire spa complex. The developers state that tree removal associated with constructing the project through the area along with rock removal and grading the nearby hillside would “irreparably damage the entire planned experience” and would make the Spruce Creek Resort and Market development “tactically unviable from and experience and aesthetics perspective as well as financially unfeasible” (Rockfish Valley Investments, 2017).

Additional information regarding costs associated with the development are discussed in section 4.9.8. Consultations between Atlantic and the developer are ongoing.

Five route alternatives analyzed in section 3.3.7 and 3.3.8, and the Spruce Creek Route Variation analyzed in section 3.4.1, would avoid the Spruce Creek Resort and Market development. For the reasons discussed in these sections, we do not recommend that Atlantic adopt the alternatives or variation.

4.8.4.4 Bone Development, Inc., TR Lamm Subdivision, and McClauren Subdivision

The Bone Development, Inc., TR Lamm Subdivision, and McClauren Subdivision are three separate planned residential developments in Nash, Wilson, and Cumberland Counties, North Carolina, respectively. As listed in table 4.8.4-1, the AP-2 mainline would cross 1,100 to 2,800 feet of these developments. At the Bone Development, Inc. property, the AP-2 mainline would cross the northwestern corner in an area currently being developed as an access road. At the TR Lamm Subdivision, the AP-2 mainline would cross a portion of 10 to 11 planned platted lots. At the McClauren Subdivision, the AP-2 mainline would cross a portion of the planned 36-lot residential development. The schedule for the development of these areas is unknown.

Based on Atlantic's consultations, the proposed route through the Bone Development, Inc. development is agreeable to the developer. The proposed route through the TR Lamm Subdivision is tentatively agreeable to the developer, pending review of a final plat map against the project. Atlantic has aligned the pipeline route along the McClauren Subdivision property line based on discussions with the developer and to avoid conflicts with the development plans. Atlantic would continue to coordinate with the developer of the McClauren Subdivision and permitting authorities to identify and address any potential construction-related impacts.

4.8.4.5 General Comments

We received several comments expressing concern that the project would take away opportunities to further develop lots or subdivisions, limit future development of nurseries and orchards, and undermine local planning and zoning restrictions that aim to preserve local heritage, restrict development, and promote responsible growth. The primary impact that a pipeline project could have on a proposed development would be to place permanent right-of-way on lots set aside for development, which could affect the constructability of the lots. Depending on the number and location of affected lots, the developer could choose to redesign the affected portion of the development. Depending on the stage of the development, this redesign could require additional review and approval by local permitting officials, which could delay the development. ACP and SHP could also impact approved and proposed developments if the construction schedules for the projects and development projects coincide. Impacts due to construction and operation of ACP and SHP would vary depending upon the stage of the planned developments, ownership of the parcels, and status of easement negotiations at the time of construction. In any situation, Atlantic and DETI would seek to obtain the appropriate state or county permits (rezoning, development plan, etc.), and would either purchase the property or negotiate an easement from the current landowner to construct and operate the proposed projects. Landowners would continue to have use of the right-of-way provided such use does not interfere with the easement rights granted to Atlantic and DETI for construction and operation of the pipeline system.

The planned developments identified in this EIS are those that have been formally communicated to local planning and zoning authorities. Any additional planned developments not on file with these entities are considered speculative in nature. Landowners would have the opportunity to request that development plans for their property be considered during easement negotiations with Atlantic and DETI and that specific measures to accommodate future plans be considered. Pipeline infrastructure would generally be consistent with areas already zoned for industrial development, and most land uses within other zoned areas would be allowed to continue during pipeline operation and not conflict with the activities in which an area is zoned.

As discussed in section 4.8.1.1, the land retained as permanent right-of-way in non-forested areas would be allowed to revert to its former use and landowners would have use of the permanent right-of-way. Certain activities such as the construction of permanent structures, including houses, house additions, trailers, tool sheds, garages, poles, patios, pools, septic tanks, or other objects not easily removable, or the planting of trees, would be prohibited within the permanent right-of-way. Post-construction maintenance of the permanent right-of-way would prevent the reestablishment of trees, including orchards and tree crops, to promote accessibility for maintenance and inspection, and for emergency response access.

Atlantic and DETI incorporated several route variations into their pipeline routes to minimize or avoid impacts on planned developments as described in section 3. In addition to implementation of Atlantic's and DETI's general construction impact minimization methods, Atlantic and DETI also attempted to route the pipeline along property boundaries where practicable to minimize potential impacts on existing and planned residential developments. Construction activities would result in temporary impacts for any development occurring concurrently with construction of ACP or SHP. Operational impacts would be limited to the encumbrance of a permanent right-of-way, which would prevent the construction of permanent structures and trees within the right-of-way. We conclude that implementation of the identified mitigation measures would minimize or mitigate the impacts of the projects on existing planned residential areas and developments.

4.8.5 Recreation and Special Interest Areas

Based on consultations with local agencies and review of public databases and maps, ACP and SHP would cross or be located within 0.25 mile of multiple public and private lands that support recreation or special interests. Features directly affected and within 0.25 mile of the projects include National Forests, a National Scenic Trail, a National Parkway, a NWR, a state forest, trails, wildlife management areas, scenic byways, and Civil War battlefields, as discussed in the sections below. No National Parks, designated Wilderness Areas, National Natural Landmarks, recreation recovery areas, or designated wild and scenic rivers were identified within 0.25 mile of the projects. Project facilities in Pennsylvania would not affect or be within 0.25 mile of any designated recreation or special interest area. Table 4.8.5-1 lists the recreation and special interest areas affected by and within 0.25 mile of ACP and SHP. While table 4.8.5-1 lists the general MP crossings of FS lands associated with the projects, specific recreation area and special interest areas crossed within the MNF and GWNF, including trails on NFS lands, are discussed separately in section 4.8.9.

One of the primary concerns when crossing a designated recreation or special interest area is the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, resources the area aims to protect). Construction would alter visual aesthetics by removing existing vegetation and disturbing soils. Construction would also generate dust and noise, which could be a nuisance to recreational users. Construction could also interfere with or diminish the quality of the recreational experience by affecting wildlife movements or disturbing trails. Direct project impacts on recreational and special interest areas occurring outside of forested land (including managed tree plantations) would be minor and limited to the period of active construction, which typically would last only several days to several weeks in any one area. These impacts would be minimized by implementing Atlantic's and DETI's *Restoration and Rehabilitation Plan*, *COM Plan*, *SPCC Plan*, *HDD Plan*, *Timber Removal Plan*, *Invasive Plant Species Management Plan*, *Fire Plan*, and *Fugitive Dust Control and Mitigation Plan*.

TABLE 4.8.5-1

Recreation and Special Interest Areas Affected by or within 0.25 Mile of the Atlantic Coast Pipeline and Supply Header Project

Project/Facility/State or Commonwealth/County or City	Begin Milepost	End Milepost	Crossing Length (miles) [a, b]	Name	Ownership/Jurisdiction	Crossing Method	Area Affected (acres)	
							Const.	Oper.
ATLANTIC COAST PIPELINE								
AP-1 Mainline								
West Virginia								
Upshur	23.2	23.2	<0.1	U.S. Highway 119/33, National Scenic Byway (Staunton-Parkersburg Turnpike)	WVDOT	Bore	<0.1	<0.1
Upshur	23.2	23.2	<0.1	Route 33 Bikeway	Private	Bore	<0.1	<0.1
Randolph	54.2	55.3	N/A	Kumbrabow State Forest [c]	WVDNR	N/A	2.9 [c]	2.9 [c]
Pocahontas	73.1	83.9	5.1 [d]	Monongahela National Forest [d]	FS	Mixed [d]	100.4 [d]	53.5 [d]
Pocahontas	76.5	76.5	<0.1	Marlinton to Durbin Bikeway	Private	Bore	<0.1	<0.1
Pocahontas	76.6	76.6	<0.1	Greenbrier River Rail-Trail	WVDNR	Open-Cut	<0.1	<0.1
Pocahontas	76.9	79.2	3.3	Seneca State Forest	WVDNR	Conventional	50.0	28.1
Pocahontas	77.3	77.3	<0.1	Allegheny Trail	WVSPF	Open-Cut	<0.1	<0.1
Pocahontas	79.4	80.5	1.5	Seneca State Forest	WVDNR	Conventional	22.8	12.8
Virginia								
Highland	83.9	86.9	4.0 [e]	GWNF [e]	FS	Mixed [e]	301.3 [e]	156.9 [e]
Highland	90.3	91.0	1.1	VOF Easement (Teague)	VOF	Conventional	19.3	10.1
Highland	91.3	91.3	<0.1	U.S. Highway 220 Virginia Byway	VDOT	Bore	<0.1	<0.1
Bath	93.7	106.1	4.1 [e]	GWNF [e]	FS	Mixed [e]	301.3 [e]	156.9 [e]
Bath	95.3	96.1	1.1	VOF Easement (Normandy Capitol)	VOF	Conventional	17.9	16.3
Bath	97.5	97.5	<0.1	Headwaters of the James Loop Trail	Private	Bore	<0.1	<0.1
Bath	99.7	100.4	1.1	VOF Easement (Rice)	VOF	Conventional	16.5	9.3
Bath	100.6	100.7	0.1	VOF Easement (Chandler)	VOF	Conventional	2.6	1.2
Bath	103.6	104.2	0.9	VOF Easement (Revercomb)	VOF	Conventional	20.4	11.6
Bath	104.2	104.6	0.7	VOF Easement (The Wilderness, LLC)	VOF	Conventional	10.1	6.2
Bath	104.6	105.3	1.1	VOF Easement (The Wilderness, LLC)	VOF	Conventional	19.4	11.4
Bath	106.1	106.5	0.6	VOF Easement (Bright and Wilfong)	VOF	Conventional	9.2	4.4
Bath	106.6	106.8	0.2	VOF Easement (Berry)	VOF	Conventional	2.7	1.5
Augusta	106.8	106.8	0.1	VOF Easement (Berry)	VOF	Conventional	0.8	0.8
Augusta	112.6	112.8	N/A	Forest Trails Loop Trail	Private	N/A	N/A	N/A
Augusta	112.9	158.2	7.8 [e]	GWNF [e]	FS	Mixed [e]	301.3 [e]	156.9 [e]
Augusta	114.8	114.8	<0.1	Headwaters of the James/Forest Trails Loop Trail	Private	Bore	<0.1	<0.1
Augusta	114.8	114.8	<0.1	U.S. Highway 250 National Scenic Byway (S-P Turnpike)	VDOT	Bore	<0.1	<0.1
Augusta	116.7	116.7	<0.1	Braley Pond Road	Private	Bore	<0.1	<0.1

TABLE 4.8.5-1 (cont'd)

Recreation and Special Interest Areas Affected by or within 0.25 Mile of the Atlantic Coast Pipeline and Supply Header Project

Project/Facility/State or Commonwealth/County or City	Begin Milepost	End Milepost	Crossing Length (miles) [a, b]	Name	Ownership/Jurisdiction	Crossing Method	Area Affected (acres)	
							Const.	Oper.
Augusta	116.7	116.7	<0.1	Forest Trails Loop Trail	Private	Conventional	<0.1	<0.1
Augusta	125.9	125.9	<0.1	State Highway 42, Virginia Byway	VDOT	Bore	<0.1	<0.1
Augusta	129.3	129.3	<0.1	Headwaters of the James/Forest Trails Loop Trail	Private	Bore	<0.1	<0.1
Augusta	134.1	134.1	<0.1	Forest Trails Loop Trail	Private	Conventional	<0.1	<0.1
Augusta	144.1	144.1	<0.1	Tinkling Spring Road, Virginia Byway (VA Secondary Road 608)	VDOT	Bore	<0.1	<0.1
Augusta	156.4	157.6	N/A	Thomas Jefferson Loop Trail	Private	N/A	N/A	N/A
Augusta/Nelson	158.2	158.3	0.1 [f]	ANST and BRP [f]	FS and NPS	HDD [f]	<0.1 [f]	<0.1 [f]
Nelson	158.6	158.6	<0.1	Nelson Scenic Loop, Beech Grove Road (VA Secondary Road 664)	VDOT	HDD	<0.1	<0.1
Nelson	158.6	158.9	N/A	Nelson Scenic Loop, Beech Grove Road (VA Secondary Road 664)	VDOT	N/A	N/A	N/A
Nelson	158.9	158.9	<0.1	Nelson Scenic Loop, Beech Grove Road (VA Secondary Road 664)	VDOT	Bore	<0.1	<0.1
Nelson	163.1	163.1	<0.1	Rockfish Valley Highway (VA Route 151)	VDOT	Bore	<0.1	<0.1
Nelson	163.3	163.3	<0.1	Rockfish Valley Trail	Private	Bore	<0.1	<0.1
Nelson	163.3	163.4	0.1	Spruce Creek Park	Private	Conventional	1.5	0.9
Nelson	164.4	164.4	<0.1	Rockfish Valley Trail	Private	Bore	<0.1	<0.1
Nelson	173.5	174.0	0.5	VOF Easement (Saunders)	VOF	Conventional	6.6	4.8
Nelson	174.1 [g]	174.2	0.1	VOF Easement (Saunders)	VOF	Conventional	0.2	0.0
Nelson	183.3	183.3	<0.1	James River Loop Trail	Private	Bore	<0.1	<0.1
Nelson	183.3	184.3	1.0	James River WMA	VDGIF	Conventional /HDD	15.2	9.1
Nelson	184.4	184.7	0.3	James River WMA	VDGIF	HDD	4.5	2.7
Nelson/ Buckingham	184.7	184.7	<0.1	James River Heritage Trail	VDGIF	HDD	<0.1	<0.1
Buckingham	199.0	201.2	N/A	Horsepen Lake WMA	VDGIF	N/A	N/A	N/A
Buckingham	200.8	200.8	<0.1	Appomattox Court House Loop Trail	Private	Bore	<0.1	<0.1
Cumberland	213.5	213.5	<0.1	Virginia Lee's Retreat Byway (Raines Road 45, VA Secondary Road 636)	VDOT	Bore	<0.1	<0.1
Cumberland	215.8	215.8	<0.1	Virginia Lee's Retreat Byway (Cumberland Road, VA Route 45)	VDOT	Bore	<0.1	<0.1
Cumberland	215.8	215.8	<0.1	Heart of the Piedmont Loop Trail	Private	Bore	<0.1	<0.1
Cumberland	219.9	219.9	<0.1	River Road (VA Secondary Rd. 600)	VDOT	Bore	<0.1	<0.1

TABLE 4.8.5-1 (cont'd)

Recreation and Special Interest Areas Affected by or within 0.25 Mile of the Atlantic Coast Pipeline and Supply Header Project

Project/Facility/State or Commonwealth/County or City	Begin Milepost	End Milepost	Crossing Length (miles) [a, b]	Name	Ownership/Jurisdiction	Crossing Method	Area Affected (acres) Const.	Area Affected (acres) Oper.
Prince Edward	222.6	222.6	<0.1	Virginia Lee's Retreat Byway (VA Secondary Rd. 619)	VDOT	Bore	<0.1	<0.1
Prince Edward	224.7	224.7	<0.1	Gully Tavern Road (Lockett Road, VA Secondary Road 600)	VDOT	Bore	<0.1	<0.1
Prince Edward	225.7	225.7	<0.1	Heart of the Piedmont Loop Trail	Private/Local	Bore	<0.1	<0.1
Nottoway	228.7	228.7	<0.1	U.S. Bike Route 1 (along VA Secondary Route 628)	VDOT	Bore	<0.1	<0.1
Dinwiddie	253.5	254.3	0.8	WBWF Easement [h]	WBWF	Conventional	13.5	7.5
Dinwiddie	254.6	254.7	0.1	WBWF Easement [h]	WBWF	Conventional	2.4	1.0
Dinwiddie	255.1	255.9	0.7	VOF Easement (Scott Timberland)	VOF	Conventional	12.7	6.6
Dinwiddie	256.5	256.7	0.2	WBWF Easement [h]	WBWF	Conventional	3.9	2.1
Dinwiddie	257.8	259.3	1.4	WBWF Easement [h]	WBWF	Conventional	23.9	13.4
Dinwiddie	260.7	261.9	1.2	WBWF Easement [h]	WBWF	Conventional	20.8	11.2
Dinwiddie	261.9	262.3	0.4	WBWF Easement [h]	WBWF	Conventional	6.8	3.7
Brunswick	267.7	267.7	<0.1	East Coast Greenway (planned along U.S. Route 1)	DOT	Bore	<0.1	<0.1
Brunswick	274.9	275.2	0.4	VOF Easement (Brandon)	VOF	Conventional	4.6	2.7
AP-2 Mainline								
North Carolina								
Northampton	9.8	9.8	<0.1	Roanoke River Paddle Trail	Private	HDD	<0.1	<0.1
Northampton	9.8	9.9	0.1	USACE Easement (Lower Roanoke River)	USACE	HDD	<0.1	<0.1
Halifax	20.5	20.5	<0.1	State Highway 561 Byway	NCDOT	Bore	<0.1	<0.1
Johnston	98.5	98.5	<0.1	USACE Easement (Neuse River)	USACE	Conventional	0.6	0.1
Johnston	100.7	100.7	<0.1	Devil's Racetrack Road North Carolina Byway (Road 1009)	NCDOT	Bore	<0.1	<0.1
Cumberland	154.2	154.3	0.1	USACE Easement (Cape Fear River)	USACE	HDD	<0.1	<0.1
AP-3 Lateral								
North Carolina								
Northampton	9.2	9.2	N/A	NCEEP Easement	NCDEQ	N/A	N/A	N/A
Northampton	9.2	9.2	N/A	NCEEP Easement	NCDEQ	N/A	N/A	N/A
Northampton	9.4	9.4	N/A	NCEEP Easement	NCDEQ	N/A	N/A	N/A
Northampton	9.4	9.4	N/A	NCEEP Easement	NCDEQ	N/A	N/A	N/A
Northampton	9.4	9.4	N/A	NCEEP Easement	NCDEQ	N/A	N/A	N/A
Virginia								
Southampton	19.6	19.6	<0.1	Meherrin Road Virginia Byway (VA Route 35)	VDOT	Bore	<0.1	<0.1
City of Suffolk	54.6	54.6	<0.1	Beaches to Bluegrass Trail (planned)	Private	Conventional	<0.1	<0.1

TABLE 4.8.5-1 (cont'd)

Recreation and Special Interest Areas Affected by or within 0.25 Mile of the Atlantic Coast Pipeline and Supply Header Project

Project/Facility/State or Commonwealth/County or City	Begin Milepost	End Milepost	Crossing Length (miles) [a, b]	Name	Ownership/Jurisdiction	Crossing Method	Area Affected (acres)	
							Const.	Oper.
City of Suffolk	60.1	60.1	<0.1	Suffolk Loop Trail	Private	Bore	<0.1	<0.1
City of Suffolk	68.8	71.7	N/A	Suffolk Loop Trail Access	Private	N/A	N/A	N/A
SUPPLY HEADER PROJECT								
TL-635 Loopline								
West Virginia								
Westmoreland	3.7	3.8	0.1	Westmoreland Conservancy	Private	Conventional	0.8	0.4
Doddridge	9.4	9.4	<0.1	North Bend Rail-Trail	WVDNR	Bore	<0.1	<0.1
Doddridge	9.5	9.5	<0.1	American Discovery Trail	Private	Bore	<0.1	<0.1
Wetzel	23.7	27.3	3.6	Lewis Wetzel WMA	WVDNR	Conventional	53.3	21.4
Wetzel	27.6	27.7	0.1	Lewis Wetzel WMA	WVDNR	Conventional	1.0	0.6

[a] N/A = Project does not cross feature. However, the project is within 0.25 mile of the feature (if area affected are listed as "N/A") or ATWS would affect the feature (if construction acres are listed).

[b] Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost. However, the project total miles crossed represent the actual distance.

[c] Impacts are limited to use of an existing road with the forest. Referred to as access road 04-002-B001.AR6.1 (see appendix E).

[d] ACP would cross the MNF at various locations between milepost range listed. MNF-specific impacts are discussed separately in section 4.8.9.1. Table 4.8.9-1 lists the specific crossing locations and table 4.8.9-2 lists the impacts (acres) by land use type associated with ACP on the MNF.

[e] ACP would cross the GWNF at various locations between milepost range listed, including the ANST located on GWNF-managed land. GWNF- and ANST-specific impacts are discussed separately in section 4.8.9.1. Table 4.8.9-1 lists the specific crossing locations; table 4.8.9-2 lists the impacts (acres) by land use type associated with ACP on the GWNF; and table 4.8.9-12 lists the recreational and special interest areas crossed by ACP within the GWNF.

[f] BRP-specific impacts are discussed separately in section 4.8.9.1. Table 4.8.9-2 lists the impacts (acres) by land use type associated with ACP on the BRP.

[g] Associated with temporary workspace crossing; pipeline centerline does not cross at this location.

[h] Conservation easements held by the WBWF surround the Fort Pickett Military Reservation and have been acquired in cooperation with the Virginia National Guard, U.S. Army, and U.S. Department of Defense.

NCDOT = North Carolina Department of Transportation

NCEEP = North Carolina Ecosystem Enhancement Program

VDOT = Virginia Department of Transportation

WVDOT = West Virginia Department of Transportation

To ensure public safety and a safe working environment for project personnel, it may be necessary to limit access to designated recreation or special interest areas during construction activities. These impacts would be limited to the time of active construction and would cease when construction is complete. Atlantic and DETI would work with the landowners of the recreation and special interest areas to avoid, minimize, or mitigate impacts on these areas, as requested and discussed further by area below. Atlantic and DETI would attempt to maintain access to the areas during construction of the pipeline, and if necessary, would compensate the landowner(s) for the value of any lost resources. Atlantic and DETI would also coordinate with land managing agencies and private landowners regarding the best way to inform the public of planned construction activities and/or to coordinate the timing of construction activities. Public notification measures could include signage on recreation area access routes, website notifications, and targeted mailings.

Following construction, most open land uses would be able to revert to their former uses. Forest land affected by the temporary construction right-of-way and ATWS areas, however, would experience long-term impacts because of the time required to restore the woody vegetation to its preconstruction condition (at least 30 years). Further, the placement of aboveground facilities and permanent access roads, as well as forest land within the operational right-of-way, would experience permanent impacts as a result of a land use and vegetation type conversion. However, operation of ACP and SHP would not interfere with most recreational activities.

The landscape of the states crossed by ACP and SHP provide ample opportunities for public enjoyment of dispersed recreation including fishing, hunting, boating, on-trail hiking, biking, horse riding, foraging, photography, caving/spelunking, and driving for pleasure. Details regarding the potential impacts on specific designated federal, state, county, and local recreation areas crossed by the projects, which may provide these recreational opportunities, as well as mitigation measures proposed by the Applicants, are discussed below. The following provides a summary of fishing, hunting, and caving/spelunking opportunities in the general project area in response to scoping comments.

We received comments expressing concern about the potential for construction of ACP and SHP to interfere with recreational fishing opportunities (e.g., trout fishing), which are widely available in the project area. In West Virginia, Virginia, and North Carolina, recreational fishing for freshwater species is permitted year-round with a few exceptions. In West Virginia, the WVDNR has established size and count limits for individual species and specific waterbodies (WVDNR, 2016a). The VDGIF has established seasonal timing restrictions for some species of freshwater fish, such as trout and non-game fish (VDGIF, 2016f). The NCWRC has established seasonal size and creel limits for some inland game fish, such as trout and various species of bass, and for individual inland waters (NCWRC, 2016c). In Pennsylvania, recreational fishing for most freshwater species is permitted year-round, but fishing for species such as trout and salmon is limited to the spring and summer months. A detailed discussion of the waterbodies that would be crossed by ACP and SHP, including construction and operation impacts and proposed restoration procedures, is provided in section 4.3.2. Impacts on freshwater fish species and fisheries are discussed in section 4.6.

We also received comments expressing concern that ACP and SHP would restrict access to hunting during construction, would permanently remove hunting areas, and could promote OHVs use associated with illegal hunting along the pipeline right-of-way. Both public and private land is open to the public for hunting throughout the area of the projects; however, landowner permission must be obtained for access to hunting on private land. In general, hunting seasons throughout the project areas vary by species. In West Virginia, the open season for most species begins during the fall and extends into the early winter months (i.e., September through December) and the open season for some game species occurs during the winter months (i.e., November through February) (WVDNR, 2016b). West Virginia and Virginia also hosts an open season for turkey hunting in April and May each year. The hunting season in Virginia generally begins in the fall and extends into the winter months (i.e., October through March) for most game species. Virginia also hosts an open season for turkey hunting in April and May each year (VDGIF, 2016g). In North Carolina, the earliest game hunting seasons begin in September and the latest seasons close in February (NCWRC, 2016d). The hunting season in Pennsylvania generally begins in September and October and continues into December and January, with the open season for most species occurring in October, November, and December. As such, it is likely that construction would overlap with the various hunting seasons. During construction, hunters may not be able to access certain tracts of land, depending on where construction is occurring at any given time. This impact would be temporary and last only one hunting season. Hunting opportunities that could be displaced by the construction of the projects would not represent a significant impact since the areas outside of the construction workspace would remain available for hunting, which are subject to applicable laws and regulations, and the number of hunting permits that are issued would not change as a direct result of construction of the projects. Following construction, access to available hunting areas would be allowed to resume and operation of the project would not affect future hunting activities. Atlantic and DETI would actively discourage use of OHVs on its pipeline right-of-way to avoid issues related to illegal access, erosion, and disturbance to restored areas. Measures that may be used to discourage OHV use may include installing barriers such as signs, fences, gates, vegetation, or boulders along the right-of-way. Atlantic and DETI would also coordinate with the appropriate land-managing agencies to identify and prioritize where installation of OHV deterrents would be beneficial.

We also received comments regarding the potential to interrupt public access to caves as a result of construction and operation of ACP and SHP. Sinkholes, springs, and solution caves are characteristic of karst terrain (National Speleological Society, 2016). Numerous caves are present in the karst terrain crossed by the projects and the area is popular among speleologists[16] (colloquially referred to as cavers or spelunkers). Public access to caves around the projects is relatively abundant. Public show caves or commercial caves consisting of lighted pathways exist in West Virginia, Virginia, North Carolina, and Pennsylvania; however, the true extent of the cave system in this area is still being explored (National Caves Association, 2016). For example, over 4,300 caves have been reported in Virginia, the majority of which occur in the western part of the state (Virginia Speleological Survey, 2016a; 2016b). Sharp's Cave and Dreen Cave in Pocahontas County, West Virginia are popular destinations for speleologists and recreational cavers (Onlyinyourstate.com, 2016a), and the Grand Caverns is a well-known tourist destination in Rockingham County, Virginia (Grand Caverns.com, 2016). Most of the caves in North Carolina are located within the western portion of the state and far from the area of effects for ACP (Onlyinyourstate.com, 2016b). ACP and SHP would not cross the known extent of any commercial caves; however, previously unidentified or unnamed caves may be encountered during construction. Cavers may not be able to access certain tracts of land, depending on where construction is occurring at any given time. This impact would be temporary. Following construction, access to caves would be allowed to resume and operation of the projects would not affect future caving excursions. Construction and operation of the projects in karst terrain is discussed in detail in section in 4.1.2.3.

It should be noted that in 2013, the FS closed all the caves located within the MNF and GWNF to public access to prevent the spread of WNS amongst local bat communities (FS, 2016e). The WVDNR and VDGIF have also requested that caves with significant bat colonies be avoided (WVDNR, 2012; VDGIF, 2016h). Additional information regarding WNS and its impact on local bat populations around ACP and SHP is provided in sections 4.5.1.1, 4.7.1.1, 4.7.1.3, and 4.7.1.4.

The following sections describe specific recreational and special interest areas that are crossed by or within 0.25 mile of ACP and SHP. However, recreational opportunities on federal lands are addressed separately in section 4.8.9, including NFS lands, the ANST, and the BRP. As discussed by feature below,

[16] A person who engages in the scientific study of caves or caving.

ACP would cross linear trails where a detour or temporary closure may be required. Atlantic has proposed general mitigation measures and committed to developing site-specific crossing plans in consultation with the applicable land-managing agency. Based on the impacts identified and mitigation measures Atlantic and DETI would implement, we do not believe ACP and SHP would result in significant or adverse impacts on recreational or special interest areas. Visual impacts on recreational and special interest areas that are designated for their scenic value are discussed in section 4.8.8.

4.8.5.1 West Virginia

U.S. Highway 119/33, National Scenic Byway (Staunton-Parkersburg Turnpike)

ACP would cross U.S. Highway 119/33 at AP-1 MP 23.2 in Upshur County, West Virginia (see table 4.8.5-1). U.S. Highway 33 is part of the Staunton-Parkersburg Turnpike, a National Scenic Byway. The National Scenic Byways Program is part of the DOT, FHA. The program was established to help recognize, preserve, and enhance selected roads throughout the United States that are recognized as All-American Roads or National Scenic Byways based on one or more archeological, cultural, historic, natural, recreational, and scenic qualities (FHA, 2016a). The byway is owned and managed by the West Virginia Department of Transportation (WVDOT). The 180-mile-long byway is an historic highway that runs from Staunton, Virginia across West Virginia to the Ohio River (The Staunton-Parkersburg Turnpike, 2016). Views from the byway include Civil War battlefields and sites (West Virginia, Wild and Wonderful, 2016; FHA, 2016b).

Land uses on either side of the byway at the crossing locations along the AP-1 mainline consist of open and developed land. Developed land north of the highway consists of a residence and several large commercial/industrial buildings. ACP would cross byways using the bore crossing method, which is described in section 2.3.3.2. Direct impacts on the byway would be avoided; however, scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Recreational uses of the byway would not be affected by operations. Visual impacts on users of the scenic byway are discussed in section 4.8.8.

Motor Route Trails

ACP and SHP would cross or be located within 0.25 mile of private road trails and bike trails on roads listed in table 4.8.5-1. These consist primarily of state and local roads connecting multiple discrete sites where birds and other wildlife can be observed. Trails crossed by the projects in West Virginia include the Route 33 Bikeway and the Marlinton to Durbin Bikeway, and the American Discovery Trail, which offers access to scenic vistas; rivers provide for whitewater rafting, kayaking, and canoeing; spelunking; rock climbing; and historic and natural points of interest (American Discovery Trail, 2016).

The projects would affect less than 0.1 acre of land at each trail/road crossing. Atlantic and DETI would cross most trails using the bore method (see table 4.8.5-1), as described in section 2.3.3.2. As with other special interest areas crossed using the bore a method, direct impacts would be avoided. Recreationalists would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Although direct impacts on trails crossed using the bore method would be avoided, Atlantic would consult with the various trail stewards to identify any additional site-specific methods to limit disturbance of trail traffic. Recreational use of trails would be allowed to continue throughout construction. Recreational uses of the trails/roads would be allowed to continue throughout project operation.

Kumbrabow State Forest

Although not crossed by the pipeline right-of-way, an existing road within the Kumbrabow State Forest would be used to access the AP-1 mainline at MP 53.2 in Randolph County, West Virginia (see table 4.8.5-1). Access road 04-002-B001.AR6.1 is an existing road that would be improved for construction. Use of the road by recreationalists accessing the western part of the state could be limited because of access road use by construction vehicles and equipment. This would be temporary and limited to the time of construction.

Monongahela National Forest

The AP-1 mainline would pass through the MNF at multiple locations between MPs 73.1 and 83.9 for a total of 5.2 miles in Pocahontas County, West Virginia (see table 4.8.9-1). The MNF is managed by the FS, a civilian federal agency within the USDA. The MNF encompasses more than 921,000 acres. It is the largest expanse of public land in West Virginia, and fourth largest National Forest in the 20 northeastern states. It is in proximity to major population centers of the region, including Washington, D.C., Baltimore, Philadelphia, and Pittsburg. The MNF contains an estimated 52 percent of the publicly available recreation land in West Virginia and draws users from local areas, across the state, and surrounding states. Due in large part to its geographic location in the Mid-Atlantic Region and its mountainous terrain, the MNF is one of the most ecologically diverse forests in the NFS. The steep slopes of the mountains within the MNF give rise to nearly 600 miles of coldwater streams that become the Tygarts Valley, Potomac, Cheat, Greenbrier, Elk, and Gauley Rivers.

Project-related impacts on federal lands, which include the MNF, are addressed in more detail in section 4.8.9.1 of this EIS.

Greenbrier River Rail-Trail

The AP-1 mainline would cross the Greenbrier River Rail-Trail at MP 76.6 in Pocahontas County, West Virginia (see table 4.8.5-1). The 78-mile-long Greenbrier River Rail-Trail parallels the Greenbrier River; crosses the Seneca State Forest (discussed below); and offers biking, backpacking, cross-county skiing, and horseback riding (WV State Parks, 2016c). The trail is owned by the WVDNR and managed by the WV State Parks.

Land uses on either side of the trail crossing consists of forest land. Atlantic has proposed to cross the Greenbrier River Rail-Trail using conventional construction methods (open-cut). As a result, this crossing would require a temporary trail closure, which would impact recreational users' experience of the trail. We requested that Atlantic evaluate the feasibility of using either the bore or HDD method to cross all recreational trails (land and water) affected by the project. As discussed in section 2.3.3.2, these methods would allow for continued use of the feature being crossed during construction. According to Atlantic, the ATWS associated with either of these methods would result in greater land disturbance compared to the open-cut crossing method. For example, a conventional bore would require at least two 100-foot by 25-foot ATWS areas on each side of the trail to allow for equipment staging and storage of spoil removed for the bore pits. Atlantic also contends that, due to engineering and design requirements, the minimum length of an HDD crossing is about 2,500 feet. The path of the HDD (i.e., pipeline route) crossing the feature would need to be relatively straight and located in an area where workspace is available to accommodate HDD equipment. Also, additional area would be required to accommodate a fabrication and pull-back area equal to the length of the crossing (at least 75 feet by 2,500 feet). Based on these considerations, adopting the bore or HDD method to cross a feature that is less than 200 feet long does not offer a significant advantage over the use of the open-cut method.

In response to our recommendation in the draft EIS, Atlantic developed a site-specific crossing plan for the Greenbrier River Rail-Trail that identifies the location(s) of a detour, public notification, and signage (see appendix J). As shown on the crossing plan, the trail detour would be about 1.4 miles long and begin 0.8 mile upstream of the pipeline crossing location where trail users would be detoured onto County Highway 1, which is a county road that runs adjacent to the trail. Users would proceed south and then be directed onto Back Mountain Road. After crossing Laurel Run Road, the detour would return users to the Greenbrier River Rail-Trail. Signs would be placed at the start and end of the detour that state why the detour is needed, how long the detour would be in place, and the length of the detour, and include a map showing the overall detour. Signs would also be placed along roads in which trail users would be detoured that warn motorists of the presence of trail users and at various locations along detour. Based on Atlantic's consultations with the West Virginia State Parks (Atlantic, 2017), the agency agrees the detour is adequate to maintain an open trail during pipeline construction, which is anticipated to occur in June 2019 if the project is approved.

Long-term impacts on the trail at this crossing would include changes to forested landscape because of permanent right-of-way vegetation maintenance. Recreational uses of the trail would be allowed to continue throughout project operation.

Seneca State Forest

As listed in table 4.8.5-1, Atlantic would cross the Seneca State Forest at two locations in Pocahontas County, West Virginia. In addition, four existing roads are proposed to be used as access roads (05-001-E051.AR4, 05-001-E051.AR3, 05-001-E051.AR5, 05-001-E051.AR1; see appendix E) within the Seneca State Forest. The state forest is owned by the WVDNR and managed by the WV Division of Forestry.

The Seneca State Forest is West Virginia's oldest State Forest and offers rustic cabins, fishing, camping, hiking, biking, picnicking, hunting, boating, and swimming (WV State Parks and Forests, 2016a; WV State Parks, 2016a). Upon its purchase by the State of West Virginia, the primary purpose of the area was to ensure timber and wildlife resources for the future (WVDOF, 2016). According to the Guidelines for Managing West Virginia's Seven State Forests (WVDOF, 2013), management plans that would propose management prescription (Rxs) for specific areas of a particular forest are being developed. As of the issuance of this EIS, a management plan specific to the Seneca State Forest has not yet been issued by the WVDNR.

Based on correspondence with the WVDNR, ACP would cross Seneca State Forest lands managed by the WVDOF. In 1966, West Virginia accepted a federal grant from the LWCF to assist with the purchase of a portion of Seneca State Forest. As the recipient of the federal LWCF grant, the State of West Virginia is obligated by contract under the LWCF grant agreement to ensure that the State Forest would remain in public outdoor recreation use in perpetuity unless otherwise approved by the Secretary of the Interior (delegated to the NPS). The Secretary of the Interior could only change the use if he/she finds the new use to be in accord with an existing Statewide Comprehensive Outdoor Recreation Plans; and as necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location (36 CFR 59) (LWCF, 2008). The applicable state may allow underground utility easements within a section 6(f)(3) area as long as the easement site is restored to its pre-existing condition to ensure the continuation of public outdoor recreational use of the easement area within 12 months after the ground within the easement area is disturbed. If restoration exceeds the 12-month period, or the easement activities result in permanent above-ground changes, the NPS is consulted to determine if the changes trigger a conversion. If present or future outdoor recreation opportunities are impacted in the easement area or in the remainder of the section 6(f)(3) area, a conversion is triggered (LWCF, 2008). Any conversion requires compensation of the fair market value of land. While the responsibility for compliance with the provisions of the LWCF Act rests with the state, the state in turn consults with the NPS for guidance and to sort out details of the proposal; therefore, NPS concurrence is needed for the Seneca State Forest crossing.

We received comments on the draft EIS from the NPS stating that the agency concurs with the State of West Virginia, which believes that the implementation of the project would not result in a permanent loss of recreational use and opportunity at Seneca State Forest. The NPS notes that, despite the change in appearance, public outdoor recreation can still take place within the pipeline alignment, and the NPS would continue to work with the State of West Virginia to maintain the quality recreational experiences existing currently in Seneca State Forest. The NPS also notes, however, that the removal of LWCF protections along the pipeline alignment would establish a nonrecreational corridor that bisects the park, potentially opening the possibility for greater threats to outdoor recreational resources and opportunities at Seneca State Forest in the future.

We noted in the draft EIS that, because the project parallels just under a mile of the Allegheny Trail (which occurs within the state forest; see discussion below), the Seneca State Forest believes it would result in a conversion of the established recreational use. The NPS in its comments on the draft EIS, however, stated that it does not concur with this finding and a conversion would not be triggered.

Atlantic would cross the Seneca State Forest using conventional construction methods, as described in section 2.3.2. The sections of state forest that the AP-1 mainline would cross consists of forested land. Construction would temporarily affect a total of about 69.8 acres of the state forest. Project-related impacts and mitigation measures Atlantic would implement on this property would be similar to those described for general forested areas (see section 4.8.1.1). Recreational users would be temporarily affected by noise, dust, construction-related traffic, and visual impacts resulting from construction personnel and equipment. Section 4.8.9.2 provides the results of visual impact assessments at eight Key Observation Points (KOPs) near the Seneca State Forest in response to comments from the NPS. Also, to ensure public safety, access to the state forest where construction is occurring may be limited.

Atlantic would coordinate with the WV State Parks and WV Division of Forestry during easement negotiations to identify measures, such as avoiding construction during the peak tourist season and/or placing signage, to avoid or minimize impacts on recreationalists that are acceptable to the owner. Permanent impacts totaling 39.1 acres would occur as a result of the conversion of forested land to open land within the operational right-of-way. Atlantic would compensate the WV State Parks and WV Division of Forestry for the removal of forest land associated with construction and operation of the project, and recreational uses of the state forest would continue throughout project operation. Timber removal from the Seneca State Forest would be part of separate license agreements required by the WVDNR through the Office of Land and Streams. Based on comments received on the draft EIS from the WVDNR, Atlantic would be required to follow the guidance provided in West Virginia Silvicultural Best Management Practices for Controlling Soil Erosion and Sedimentation from Logging Operations, as well as conditions outlined in State Code, §19-1B, in addition to the commitments made in its *Timber Removal Plan*.

The removal of trees would result in a long-term impact at temporary workspace areas and a permanent impact within the operational right-of-way. We believe project-related impacts within an area specifically created to manage forest land and valued for its forest land can be reduced. Atlantic stated that it is still coordinating with the WV State Parks and WV Division of Forestry regarding specific locations where a narrowed construction right-of-way would be adopted to reduce impacts on forested lands and ecologically sensitive areas in the Seneca State Forest. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6),</u> Atlantic should identify by milepost the locations where it will adopt a narrowed**

right-of-way to reduce impacts on forest land within the Seneca State Forest, and identify the locations of corresponding ATWS. Atlantic should also provide updated and reduced construction impacts information for all applicable resources (land use, wetlands, soils, vegetation, cultural resources, etc.) affected by the changes to construction right-of-way and ATWS.

Allegheny Trail

As listed in table 4.8.5-1, ACP would cross the Allegheny Trail at AP-1 MP 77.3 in Pocahontas County, West Virginia. The 330-mile-long trail traverses the state and is maintained by the West Virginia Scenic Trails Association, Inc. (West Virginia Scenic Trails Association, Inc., 2016). The Allegheny Trail is located within the Seneca State Forest where crossed by the project (WV State Parks and Forests, 2016b). Three existing roads proposed as access roads (05-001-E051.AR3, 05-001-E051.AR5, 05-001-E051.AR1; see appendix E) are associated with or near the Allegheny Trail within the Seneca State Forest.

Land uses on either side of the trail crossing consists of forest land. Atlantic would cross the Allegheny Trail using conventional construction methods (open-cut). As a result, this crossing would require a temporary trail closure, which would impact recreational users' experience of the trail. As discussed above (Greenbrier River Rail-Trail), we requested that Atlantic evaluate the feasibility of adopting the bore or HDD method at all recreational trail (land and water) crossings. However, for the reasons stated, use of one of these methods would not offer a significant advantage over the open-cut crossing method at a relatively narrow trail crossing.

In response to our recommendation in the draft EIS, Atlantic consulted with the WVDNR and Seneca State Forest regarding a site-specific crossing plan for the Allegheny Trail. Based on Atlantic's consultations with the agencies, the Allegheny Trail would be permanently relocated by the State of West Virginia prior to construction of ACP (Atlantic, 2016; Atlantic, 2017). The new pipeline crossing location would be at AP-1 MP 78.1, which is at the top of a ridge near an existing hiker shelter adjacent to the Seneca Forest Loop Road.

Protective orange safety fence would be installed on both sides of the trail crossing and, up until pipeline installation occurs, users would be directed to cross the trail within the fenced area across the right-of-way. Once pipeline installation is ready to begin, trail traffic would be suspended for several hours while construction commences. Following backfilling of the pipeline trench, the orange safety fence would be re-installed and trail traffic would be allowed to continue. Right-of-way restoration would continue around the fenced section of the trail. At the request of the trail stewards, stone would be placed on the operational right-of-way as it crosses the trail. Signs warning hikers of construction activities and listing the safety requirements associated with crossing the restricted, fenced area would be placed on both sides of the construction right-of-way, with additional safety signs attached to the safety fencing warning trail users to stay within the fenced boundaries of the trail (see appendix J).

In Atlantic's meetings with the WVDNR, the agency noted that it would hold a timber sale in 2018 to include the portion of the pipeline construction right-of-way at the trail crossing. The area of forest clearing associated with the relocated trail crossing would be increased to provide a scenic vista for hikers crossing the ridge.

Based on Atlantic's consultations with the WVDNR and Seneca State Forest, the new trail location, the proposed construction methods and limited time in which the trail would be off limits to users, and the commitment to install signage and safety fencing, we determined a site-specific plan is not necessary for the Allegheny Trail crossing, which would take place in the first quarter of 2019 if the project is approved.

Long-term impacts on the trail at this crossing would include changes to the scenic quality of the existing forested landscape as a result of permanent right-of-way vegetation maintenance (see section 4.8.8). Recreational uses of the trail would be allowed to continue throughout project operation.

Westmoreland Conservancy

We received comments on the draft EIS identifying lands owned by the Westmoreland Conservancy that would be crossed by the SHP route (see table 4.8.5-1). The Westmoreland Conservancy's mission is to acquire lands that conserve the rural and rustic nature of Western Pennsylvania. According to the Conservancy, the SHP would cross an area that contains walking and hiking trails that connect another 5 to 6 miles of walking and hiking trails in other land holdings owned, operated, and maintained by the Conservancy (Westmoreland Conservancy, 2017). The property contains mature hardwood forest.

DETI would cross the Westmoreland Conservancy property using conventional construction methods (open-cut). Construction would temporarily affect a total of about 0.8 acre of land. Project-related impacts and mitigation measures DETI would implement on this property would be similar to those described for general forested areas (see section 4.8.1.1). Recreational users would be temporarily affected by noise, dust, construction-related traffic, and visual impacts resulting from construction personnel and equipment. While operation of the project would allow recreational use of the area to continue, the removal of trees would result in a long-term impact at temporary workspace areas and a permanent impact within the operational right-of-way.

The Conservancy notes that DETI has been in consultation regarding alternatives at this location. In section 3.4.2, we analyzed a possible alternative that would minimize impacts on conservation lands and eliminate waterbody and wetland impacts; however, additional information is needed to determine whether the variation offers advantages that are environmentally significant. Therefore, we have recommended in section 3.4.2 that DETI continue to consult with the Westmoreland Conservancy regarding a rout variation to minimize impacts on conservation easements, and provide any proposed route modifications.

North Bend Rail-Trail

As listed in table 4.8.5-1, DETI's TL-635 loopline would cross the North Bend Rail-Trail in Doddridge County, West Virginia. The North Bend Rail-Trail is an abandoned spur of the CSX railroad system that is now a multi-use recreational trail operated by the WV State Parks (WV State Parks, 2016d). The trail passes state, county, and local parks, as well as historical points of interest.

Land uses on either side of the trail crossing consists of forest land. DETI would cross the North Bend Rail-Trail using conventional construction methods (open-cut). As a result, this crossing would require a temporary trail closure, which would impact recreational users' experience of the trail. We requested that DETI evaluate the feasibility of using the bore or HDD crossing method for all trail (land and waterbody) crossings that are proposed to be crossed using the open-cut method, such as the North Bend Rail-Trail. DETI stated that both the bore and HDD methods of pipeline construction require a significantly larger disturbance area than an open-cut crossing due to ATWS requirements to accommodate equipment staging and storage of spoil removed for bore pits. ATWS associated with the current crossing method (open-cut) consist of two 100 feet by 25 feet areas and two 30 feet (approximate) by 25 feet areas. DETI stated that two additional 100 feet by 25 feet ATWS areas on each side of the trail would be required for a bore crossing. DETI also stated that, due to land and engineering requirements, crossing a relatively narrow land trail via the HDD method would be impractical.

In response to our recommendation in the draft EIS, DETI investigated a trail detour and the need for a site-specific crossing plan. DETI's detour would be located on Salem-Long Run Road (CR-38) for

1.3 miles. Based on high road traffic conditions and the narrow width of the road, it was determined the use of Salem-Long Run Road would present safety issues for detoured bicyclists and hikers. As such, DETI would adopt a similar construction process for the North Bend Rail-Trail as that described for the Allegheny Trail crossing: trail users would be directed to cross the trail within a fenced area across the right-of-way and, once pipeline installation is ready to occur, trail traffic would be suspended for several hours while construction proceeds. Signs warning hikers of construction activities and listing the safety requirements associated with crossing the restricted, fenced area would be placed on both sides of the construction right-of-way, with additional safety signs attached to the safety fencing warning trail users to stay within the fenced boundaries of the trail (see appendix J). DETI has received a License Agreement from the WVDNR to cross the trail.

Based on DETI's consultations with the WVDNR, the proposed construction methods and limited time in which the trail would be off limits to users, and the commitment to install signage and safety fencing, we determined a site-specific plan is not necessary for the North Bend Rail-Trail crossing, which would take place in August 2018 if the project is approved.

Long-term impacts on the trail at this crossing would include changes to the scenic quality of the existing forested landscape as a result of permanent right-of-way vegetation maintenance (see section 4.8.8). Recreational uses of the rail-trail would be allowed to continue throughout project operation.

Lewis Wetzel Wildlife Management Area

As listed in table 4.8.5-1, DETI's TL-635 loopline would cross the Lewis Wetzel WMA at two locations in Wetzel County, West Virginia. The landscape of the WMA consists of heavily forested areas dominated by oak-hickory and cove hardwood; numerous well locations and pipelines are scattered throughout the area. Recreational activities include hunting, including deer, turkey, quail, raccoon, squirrel, rabbit, dove, and waterfowl; fishing; and wildlife viewing (WVDNR, 2016c).

DETI would cross the Lewis Wetzel WMA using conventional construction methods, as described in section 2.3.2. The section of WMA that the TL-635 loopline would cross consists of forest land. Construction would temporarily affect about 53.3 acres of the WMA. Project-related impacts and mitigation measures DETI would implement on this property would be similar to those described for general forested areas (see section 4.8.1.1). Recreational users would potentially be temporarily affected by noise, dust, construction-related traffic, and visual impacts resulting from construction personnel and equipment. Also, to ensure public safety, access to the WMA where construction is occurring may be limited. DETI would coordinate with the owner of this area during easement negotiations to identify measures, such as avoiding construction during the peak hunting season and/or placing signage, to avoid or minimize impacts on recreationalists that are acceptable to the owner. Permanent impacts totaling 21.4 acres would occur as a result of the conversion of forested land to open land within the operational right-of-way. No permanent aboveground facilities associated with the SHP would be constructed on the Lewis Wetzel WMA. DETI would compensate the WVDNR for the removal of forest land associated with construction and operation of the project, and recreational uses of the WMA would be allowed to continue throughout project operation.

Similar to the Seneca State Forest, and based on comments received on the draft EIS from the WVDNR, timber removal from the Lewis Wetzel WMA would be part of separate license agreements required by the WVDNR; and DETI would be required to follow the guidance provided in the West Virginia Silvicultural Best Management Practices for Controlling Soil Erosion and Sedimentation from Logging Operations, as well as conditions outlined in State Code, §19-1B, in addition to the commitments made in DETI's *Timber Removal Plan*.

We received comments on the draft EIS from the NPS stating that, like the Seneca State Forest, the Lewis Wetzel WMA has received LWCF monetary assistance. While the responsibility for compliance with the provisions of the LWCF Act rests with the state, the state in turn consults with the NPS for guidance. As such, NPS concurrence is needed for the Lewis Wetzel WMA crossing. In its comments on the draft EIS, the NPS requested additional information regarding the Lewis Wetzel WMA crossing, which we have disclosed in our response to comments (see appendix Z) and noted above. We encourage the NPS to work directly with DETI regarding the WMA crossing to identify additional information necessary to determine if a conversion, as described above in the Seneca State Forest discussion, would be triggered on the Lewis Wetzel WMA as a result of construction and operation of the SHP.

4.8.5.2 Virginia

George Washington National Forest

The AP-1 mainline would pass through the GWNF at multiple locations between MPs 83.9 and 158.2 for a total of 16.0 miles in Highland, Bath, and Augusta Counties, Virginia (see table 4.8.9-1). The GWNF is managed by the FS, a civilian federal agency within the USDA. The GWNF covers about 1 million acres, with approximately 960,000 acres in Virginia and 106,000 acres in West Virginia. The forest contains the headwaters of the Potomac and James Rivers and contributes to the drinking water supplies of at least 30 communities including Washington, D.C. and Richmond, Virginia. It is the largest federal landowner in the Chesapeake Bay watershed. Approximately 10.5 million people live in counties that are within 75 miles of the forest border. The forest contains one of the largest blocks of forested lands under federal management in the eastern United States where habitat for a wide diversity of species needing closed, open, or interspersed habitat can be managed to meet long-term habitat objectives.

Project-related impacts on federal lands, which include the GWNF and the ANST (located on GWNF land), are addressed in more detail in section 4.8.9.1 of this EIS.

Scenic Byways

As listed in table 4.8.5-1, the AP-1 mainline would cross several roads that are designated as a national or state scenic byway/scenic road. The National Scenic Byways Program is part of the DOT, FHA. The program was established to help recognize, preserve, and enhance selected roads throughout the United States that are recognized as All-American Roads or National Scenic Byways based on one or more archeological, cultural, historic, natural, recreational, and scenic qualities (FHA, 2016a).

The Virginia Byways program is managed by Virginia Department of Transportation (VDOT) in partnership with the VDCR, and recognizes natural, cultural, historical, recreational, and archeological features along scenic roads (VDCR, 2016c; VDOT, 2016a).

Land uses on either side of the scenic byways and roads at the crossing locations consist of forest, agriculture, and open land. Atlantic would avoid direct impacts on the scenic byways and roads by using the bore crossing method, which is described in section 2.3.3.2. Specific to the U.S. Highway 250 National Scenic Byway and Virginia Lee's Retreat Byway (Lockett Road) crossings, Atlantic would locate ATWS associated with the bore such that tree removal would be avoided to minimize visual impacts of the pipeline right-of-way as viewed from the road. Scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities.

Recreational uses of the scenic byways would be allowed to continue throughout project operation. Visual impacts on users of the scenic byways are discussed in section 4.8.8.

Motor Route Trails

As with West Virginia, the projects would cross or be located within 0.25 mile of private road trails and bike trails on roads listed in table 4.8.5-1. These consist primarily of state and local roads connecting multiple discrete sites where birds and other wildlife can be observed. The trails crossed in Virginia include the Headwaters of the James Loop Trail; the Forest Trails Loop, Headwaters of the James/Forest Trails Loop; the Thomas Jefferson Loop Trail; the James River Loop Trail; the Appomattox Court House Loop Trail; the Heart of the Piedmont Loop Trail; and the Suffolk Loop Trail and Suffolk Loop Access Trail. Each trail is a VDGIF-designated Birding and Wildlife Trail. Also, ACP would cross the Rockfish Valley Trail, which is discussed in section 4.8.5.5.

Atlantic and DETI would cross the majority of trails using the bore or HDD method (see table 4.8.5-1), as described in section 2.3.3.2. Impacts on these trails and recreationalists would be similar to that described for other special interest areas crossed using the bore and HDD method. Also, based on Atlantic's discussions with the VDGIF and review of VDGIF information, no birding and wildlife observation sites would be crossed by the projects. Atlantic would consult with the various trail stewards to identify any additional site-specific methods to limit disturbance of trail traffic.

At the Forest Trails Loop Trail at AP-1 MPs 116.7 and 134.1, Atlantic would use conventional construction methods (open-cut). As a result, these crossings would require a temporary road trail closure, which would impact recreational users' experience of the road trails. As discussed above (Greenbrier River Rail-Trail), we requested that Atlantic evaluate the feasibility of adopting the bore or HDD method at all recreational trail (land and water) crossings. However, for the reasons stated, use of one of these methods would not offer a significant advantage over the open-cut crossing method at a relatively narrow trial crossing.

In response to our recommendation in the draft EIS, Atlantic investigated a trail detour and the need for a site-specific crossing plan for the Forest Trails Loop. The AP-1 would cross three sections of the road trail, none of which are associated with specific bird viewing stops. The nearest of these stops is Braley Pond, which is 0.5 mile from ACP and the Braley Pond Road crossing location. Atlantic would use the bore method to cross Braley Pond Road, which would allow traffic into Braley Pond and the birding site to continue throughout construction.

Because designated bird viewing stops and roads accessing these areas would be not closed during construction, we determined a site-specific plan is not necessary for the Forest Trails Loop crossing.

Recreational uses of the trail would be allowed to continue throughout project operation.

Blue Ridge Parkway

The AP-1 mainline would cross the BRP at MP 158.2 at the border of Augusta and Nelson Counties, Virginia (see table 4.8.9-1). The BRP was authorized by an act of Congress on June 30, 1936 (Public Law 74-848 and Public Law 39 Statute 535). The parkway encompasses 82,000 acres of federal land, stretching 469 miles and connecting the Shenandoah National Park in Virginia with Great Smoky Mountains National Park in North Carolina (NPS, 2013). The BRP was the first national rural parkway designed and constructed for a leisurely driving experience, and offers public access to views of central and southern Appalachian rural landscapes and forested mountains (NPS, 2013). The BRP receives more than 15 million visitors annually (BRP, 2016).

Project-related impacts on federal lands, which include the BRP, are addressed in more detail in section 4.8.9.1 of this EIS.

James River Wildlife Management Area

Atlantic's AP-1 mainline would cross the James River WMA at two locations in Nelson County, Virginia (see table 4.8.5-1). The landscape of the WMA primarily consists of open land, stands of Virginia pine, and a hardwood-pine mix with the hardwood portion being dominated by upland oaks and some hickory (VDGIF, 2016i). Similar to other WMAs, sporting opportunities such as game and waterfowl hunting and fishing are available. Impacts on wildlife and sensitive species that may occur on the James River WMA are addressed in sections 4.5.2.3 and 4.7.

Based on comments received on the draft EIS from the VDCR, ACP would cross the planned James River Heritage Trail where it equates to the James River within the James River WMA (see table 4.8.5-1). The James River Heritage Trail is a proposed system that would encompass the river and its banks from the headwaters in the Allegheny Mountains at Iron Gate to where the river empties into the Chesapeake (VDCR, 2017c).

Atlantic would cross the James River WMA using both conventional construction and HDD methods, as described in sections 2.3.2 and 2.3.3.2, respectively. Upland construction is planned for between AP-1 MPs 183.3 and 184.3; the HDD method is planned for between AP-1 MPs 184.3 and 184.8. Land use at the WMA crossing consists of forest land. The portion of the James River WMA crossed is actively managed for timber management, prescribed burning, and wildlife plantings.

Where crossed using standard upland methods, construction would temporarily affect a total of 19.7 acres of the WMA. Project-related impacts and mitigation measures Atlantic would implement on this property would be similar to those described for general forest areas (see section 4.8.1.1). Recreational users would be temporarily affected by noise, dust, construction-related traffic, and visual impacts resulting from construction personnel and equipment. Also, to ensure public safety, access to the WMA where construction is occurring may be limited by Atlantic and/or WMA staff. Permanent impacts totaling 12.5 acres would occur as a result of the conversion of forested land to open land within the operational right-of-way.

Where the HDD crosses the WMA (AP-1 MPs 184.3 to 184.8), direct impacts would be avoided. This includes impacts on wetlands within the WMA's waterfowl/shorebird management unit and the planned James River Heritage Trail. Recreationalists would experience temporary visual and noise impacts associated with construction personnel and equipment and HDD activities. Also, some minor hand cutting of brush to lay a guide wire for the HDD may be necessary between the HDD drill entry and exit points. This would consist of a pathway measuring about 2 to 3 feet wide in thickly vegetated areas. This impact would be temporary to short-term and negligible. A site-specific crossing plan showing the HDD crossing is included in appendix H.

As discussed in section 4.8.5, project-related impacts, including restoration of the area following construction would be minimized by implementing Atlantic's and DETI's *Restoration and Rehabilitation Plan*, *SPCC Plan*, *HDD Plan*, *Timber Removal Plan*, *Invasive Plant Species Management Plan*, and *Fugitive Dust Control and Mitigation Plan*. Atlantic would compensate the VDGIF for the removal of forest land associated with construction and operation of the project, and recreational uses of the WMA would continue throughout project operation. Also, prescribed burning, which is routinely used to maintain the WMA, would be allowed to continue during project operation. Atlantic has requested that VDGIF coordinate with the pipeline company prior to performing any proposed controlled burns to ensure the safety and continued reliability of the proposed pipeline. For construction personnel safety, Atlantic requests that VDGIF not perform controlled burning during tree clearing and pipeline construction within the project's limits of disturbance (including access roads).

Atlantic would implement its *Fire Plan* and *Burn Control Plan*, which outline measures to monitor and control planned burns and construction-related fires; emergency fire response; and fire training provided to construction personnel. Atlantic would also work with the VDGIF to relay information on hunting restrictions during construction and final restoration.

Atlantic would regrade and install gravel along two existing roads within the James River WMA (access roads 08-214-B004.AR1 and 08-214-B007.AR2; see appendix E). One access road (08-214-B004.AR1) is proposed to be permanently maintained and would require gravel placement before, during, and after construction. Traffic on the WMA related to the James River HDD would be limited to developing the workspace and pullback area on the west side of the James River, stringing and welding of the HDD pipeline segment, and trucking water for hydrostatic testing of the HDD pipeline segment. Although considered at one time, Atlantic no longer requires the use of an existing parking and boat ramp area on the James River WMA to park water tank trucks and to access the James River to conduct water withdrawal associated with the James River HDD crossing. Water withdrawal activities would instead occur at a public boat ramp located in the Wingina community at the State Route 56 Bridge outside of the James River WMA. Atlantic would limit pipeline and HDD construction activities and associated traffic to daytime hours, 6 days a week.

The VDGIF expressed concern regarding the project's compatibility with the management direction of WMAs. The VDGIF receives federal funding for WMAs from the FWS and does not want to compromise this funding. VDGIF staff also expressed concerns about the proposed crossing location.

We received comments on the draft EIS from the FWS that further clarified the federal nexus on the James River WMA and associated regulatory requirements. According to the FWS, two parcels within the James River WMA were acquired with federal funds from the Pittman-Robertson Wildlife Restoration Program (PR Wildlife Restoration Program) (Grants W-50-L-I and W-85-L-3), and revenue from the sale of hunting and fishing licenses (license revenue). Requirements for the use and disposal of lands acquired with license revenue and PR Wildlife Restoration Program funds are described in 50 CFR Part 80 Administrative Requirements, Pittman-Robertson Wildlife Restoration and Dingell-Johnson Sport Fish Restoration Acts. In summary, activities that are eligible for such funding include wildlife restoration, enhanced hunter education and safety, and sport fish restoration programs. The regulations do not explicitly state that utilities such as pipelines make an area ineligible for funding under the acts; however, the FWS Regional Director may find an activity eligible for funding even if this part does not explicitly designate it as an eligible activity if:

- the state fish and wildlife agency justifies in the project statement how the activity would help carry out the purposes of the Pittman-Robertson Wildlife Restoration Act or the Dingell-Johnson Sport Fish Restoration Act; and

- the Regional Director concurs with the justification.

The VDGIF and FWS' Division of Wildlife and Sport Fish Restoration have jointly determined that, as proposed, the construction and operation of the ACP would result in interference of the authorized purposes of the PR Wildlife Restoration Program (FWS, 2016p; VDGIF, 2016s). The ACP could jeopardize the VDGIF's eligibility for future grant funding under this program (50 CFR 80.21, 50 CFR 80.135, 50 CFR 80.136), which equated to about $13 million in 2017 (FWS, 2017e). As such, the FWS recommends that ACP avoid the James River WMA, or replace the affected property with another property "that is at least of equal economic value and has fish, wildlife and public use benefits consistent with the purposes of the original grant" (FWS, 2017f).

Atlantic continues to consult with the VDGIF and FWS to address concerns about the project, including avoiding sensitive management areas, limiting the construction timeframe within the WMA, and restoring the pipeline right-of-way with low shrubs and seed mixes that enhance wildlife habitat. Atlantic has provided preliminary seed mixture and application rate information to the VDGIF and would continue to consult with VDGIF on restoration practices and vegetative seed mixes to support WMA and VDGIF wildlife habitat activities. A site-specific crossing plan developed in consultation with the VDGIF is included as appendix J.

As discussed in section 3.3.6, we analyzed two route alternatives associated with the James River WMA. We conclude the route alternatives would not provide a significant environmental advantage over the proposed route and do not recommend that they be incorporated as part of the project. We anticipate that further discussion and negotiation between Atlantic and the VDGIF may result in additional minor route modifications, and/or additional construction BMPs may be developed to address agency concerns and allow the facilities to be constructed within the WMA. As discussed in section 3.3.6, should this be the case, Atlantic would need to file a revision with the FERC that outlines any shifts in alignment or VDGIF-recommended construction and mitigation requirements. These modifications would be subject to FERC review and approval prior to Certificate issuance. If an easement cannot be secured within the WMA, a route outside the WMA may be required. Similarly, Atlantic would need to file a route revision with the FERC that outlines any shifts in alignment, along with an environmental and cultural assessment of the revision.

Horsepen Lake Wildlife Management Area

The AP-1 mainline would be within 0.25 mile of the Horsepen Lake WMA between AP-1 MPs 199.0 and 201.2 in Buckingham County, Virginia (see table 4.8.5-1). The landscape of the WMA consists primarily of rolling hills and pine and hardwood forests including a mixture of mature oaks and hickory (VDGIF, 2016j). Similar to other WMAs, sporting opportunities such as game and waterfowl hunting and fishing are available.

Construction and operation of ACP would not directly affect recreational uses of the WMA. However, during pipeline construction, noise and visual impacts would occur; these would be temporary and limited to the time of construction. During operation, moderate and permanent visual impacts would result from tree clearing within the nearby permanent right-of-way.

U.S. Bike Route 1

ACP would cross U.S. Bike Route 1 at AP-1 MP 228.7 in Nottoway County, Virginia. U.S. Bike Route 1 runs north to south, is part of the U.S. Bicycle Route System, and is the same as Virginia Secondary Road 628 at this location (VDOT, 2016b).

Land use on either side of the bike route at the crossing location along the AP-1 mainline consists of forest land. ACP would avoid direct impacts on the bike route by crossing it using the bore crossing method, which is described in section 2.3.3.2. Bicyclists would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Recreational uses of the bike route would not be affected by operation of the project.

Ward Burton Wildlife Foundation and Fort Pickett

In 2007, the U.S. Army began acquiring easements within a 3- to 4-mile buffer zone surrounding the Fort Pickett Military Reservation to limit certain types of development that could be incompatible with

Fort Pickett's military mission. The buffer zone is referred to as ACUB. The ACUB program has acquired easements covering over 2,600 acres around the Fort Pickett Military Reservation (Virginia National Guard, 2015). The mission of the ACUB at Fort Pickett is to "preserve the rural character of Southside Virginia and help protect drinking water, scenic vistas, fish and wildlife habitat, and working farms and forests" (Virginia National Guard, 2015). This mission enables the prevention of encroachment on military training activities at the fort "by limiting cell phone towers, urban sprawl, light pollution, and other impacts associated with unplanned development" (Virginia National Guard, 2015).

While ACP would not cross the Fort Pickett Military Reservation, the AP-1 mainline route would cross 4.1 miles of easement land in Dinwiddie and Brunswick Counties, Virginia within the ACUB that is held by the WBWF (see table 4.8.5-1). In collaboration with the Virginia National Guard, the WBWF identifies lands around the Fort Pickett Military Reservation appropriate for conservation, which are subsequently acquired with funds from the U.S. Army and U.S. Department of Defense as easements (WBWF, 2016a). In general, conservation easements are agreements with a landowner to limit future development and subdivision, and the limitations on development promote wildlife conservation.

Specific to the ACUB's mission, ACP would not require cell phone towers within the ACUB, and would not create urban sprawl, light pollution, or unplanned development. As such, construction and operation of the project would not conflict with the ACUB's mission.

Specific to the WBWF conservation easements, ACP would affect primarily forest and agricultural (managed tree plantations and harvested forests) land. Based on Atlantic's conversations with a WBWF representative, ACP could be compatible with the ACUB program and management of these lands with proper management and cooperation with their initiatives (WBWF et al., 2016b). Atlantic would continue to consult with the WBWF to ensure that any project crossings of and impacts on easements or properties slated for conservation under the ACUB are compatible with the purpose and values of the easements. More specifically, Atlantic has noted that it is consulting with the WBWF to identify seed mixes that would be used during restoration to encourage the establishment of pollinator and wildlife habitat, which would promote compatibility with the purpose and values of the easements crossed.

We recommended in the draft EIS that, because consultations regarding the crossing of these areas is ongoing and specific measures to promote compatibility with their management and initiatives have not yet been identified, Atlantic should identify any specific construction, restoration, and/or operation mitigation measures identified by the ACUB and/or WBWF that would be implemented to promote compatibility with the purpose and values of the easements. In response to our recommendation, Atlantic provided documentation from the U.S. Department of the Army dated November 14, 2016 that stated ACP "is compatible with the purpose of the Fort Pickett Army Compatible Use Program" and that "the routes of the pipeline do not produce any significant risk to the current or future planned military operations in the installation." The document authorized the WBWF to "proceed with negotiating for an easement for the pipeline to cross" the ACUB without further review of the authorization by Fort Pickett. Atlantic stated it has secured easement agreements with the WBWF to cross the WBWF properties in the ACUB, and that it would commit to implementing the construction, restoration, and operation measures identified in the easement agreements specific to these crossings.

Recreational uses of the conservation easements would be allowed to continue throughout project operation.

Virginia Outdoors Foundation

The AP-1 mainline would cross 8.7 miles of easements held by the VOF. The VOF is a public organization that was created by Virginia General Assembly with the goal to preserve open-space lands and the natural, scenic, historic, scientific, open-space, and recreational areas of the Commonwealth. The VOF currently has more than 750,000 acres of farmland, forests, and other open space enrolled in an easement. An open-space easement limits present and future property development rights, and it allows landowners to live on the property and use it for compatible purposes (farming, forestry, recreation, etc.). Activities such as establishing rights-of-way or other easements require advance notification and/or written approval from the VOF (VOF, 2016). Table 4.8.5-1 lists the VOF easements crossed by ACP. Based on information from the VOF, table 4.8.5-2 summarizes some of the major features of each VOF easement crossed by ACP.

TABLE 4.8.5-2

Virginia Outdoors Foundation Conservation Easements Crossed by the Atlantic Coast Pipeline

Easement Name	Features
VOF Easement (Teague)	• Approximately 737-acre property used for pasturing cattle and recreation. • Adjacent to the GWNF.
VOF Easement (Normandy Capitol)	• Approximately 794-acre property, nearly all of which is classified by the VDOF as high priority conservation area. • Adjacent to the GWNF. • Approximately 360 acres of the property lies within the Burnsville Cove Conservation Site, over 9,200 acres identified by VDCR Division of Natural Heritage as having important karst resources. • The property lies within the area designated by the National Audubon Society as the Alleghany Highlands Important Bird Area.
VOF Easement (Rice)	• Approximately 298-acre property. • Adjacent to the GWNF and other lands protected by open-space easements. • The property lies within the area designated by the Audubon Society as the Alleghany Highlands IBA.
VOF Easement (Chandler)	• Approximately 53-acre property. • Adjacent to the GWNF and another property in open-space easement. • The property is within the Windy Cove Conservation Site, which includes important karst resources.
VOF Easement (Revercomb)	• Approximately 701-acre property used to raise cattle, hay, and crops. Owner also actively manages timber on property. • Adjacent to the GWNF. • A portion of the easement lies within the Windy Cove Conservation Site.
VOF Easement (The Wilderness, LLC/ Koontz)	• Approximately 729-acre property (The Wilderness, LLC). • Approximately 492-acre property (Koontz). • Adjacent to GWNF. • The primary dwelling on the property is historic, dating to 1797.
VOF Easement (Bright and Wilfong)	• Approximately 330-acre property used to raise cattle and to grow hay. Upland hardwood forests are selectively timbered. • Adjacent to GWNF.
VOF Easement (Berry)	• Approximately 113-acre property that consists of small farms and hunt camps. • Adjacent to GWNF.
VOF Easement (Saunders/Scott Timberland)	• Approximately 356-acre property.
VOF Easement (Brandon)	• Approximately 191-acre property.

Impacts on each easement would be the same as those described in section 4.8.1.1, depending on the land use types at each crossing. Specific to the VOF easement at AP-1 MP 255.1 (Scott Timberland), the VOF determined that the proposed project includes all reasonable actions to minimize harm to the property and its conservation values, and that the provisions of the easement do not prohibit Atlantic from acquiring a 75-foot-wide permanent easement (VOF, 2015).

While recreational uses of the easements would be allowed to continue throughout project operation, the other features for which each area is conserved may be affected. For example, as previously discussed, open land uses and vegetation types would continue following construction; however, forested areas would experience a permanent impact as a result of converting the operational right-of-way to open land. This in turn would result in different vegetation and wildlife. Atlantic and DETI are currently evaluating route variations or adjustments to avoid or minimize impacts on the remaining easements. For easements that cannot be avoided, as appropriate, Atlantic would compensate the landowner for the right-of way easement and losses and penalties, if any, related to the conservation easement. Atlantic is working with VOF to develop plans to minimize and mitigate construction and operation impacts of the project. In addition, Atlantic has proposed to provide two high quality open-space parcels as compensatory mitigation to VOF, in fee title, for the impacts associated with ACP: the Hayfields Farm in Highland County, Virginia and the Rockfish River property in Nelson County, Virginia.

According to Atlantic, the Hayfields Farm property is about 1,100 acres in size. Hayfields Farm site is adjacent to the VDGIF's Highland WMA and includes upland white oak and white pine forests. The property is bisected by the Bullpasture River, which supports brook, brown, and rainbow trout. The waterbody is bordered by agricultural operations, including cattle grazing and hay making, with open fields and deciduous forest on the ridges to the east and west. There are five known cold water springs on the property that have been developed into ponds and/or cisterns to provide water sources to wildlife and cattle. According to Atlantic, the Rockfish River property is about 85 acres in size. The Rockfish River property is forested; provides scenic views of the Rockfish River valley; and is visible from public roads and the James River Loop Trail. Based on our understanding of the VOF conservation regulations, these properties would satisfy multiple VOF conservation values and be consistent with the goals of the Virginia Open-Space Land Act.

Regardless of the degree of compensatory mitigation, we note that the VOF has asserted the ACP should avoid crossing VOF open space easements. Through the easement, the VOF has an interest in the specific conservation values of a property and a legal obligation to protect these values. Per the VOF, VOF easements in general provide public benefits by protecting in perpetuity significant tracts of mostly undeveloped land that contribute to the protection of water quality, productive soils, natural heritage resources, historic resources, and scenic viewsheds (VOF, 2016). The VOF also notes that Virginia's investments in conservation could be jeopardized by the project, and the degradation of protected resources may also result in a loss of confidence in the effectiveness of open-space easements by the public (VOF, 2016).

We received numerous comments on the draft EIS regarding placement of the pipeline on VOF easements. Comments from the VOF noted that the construction, maintenance, and operation of ACP is inconsistent with the open space protections afforded by the subject easements, and that ACP would constitute a conversion of the easement property as outlined in Virginia Code § 10.1-1704. The VOF further states that the impact associated with this conversation would be "very significant" (VOF, 2017). The VOF also requested that the following conditions be included with the final EIS:

> If the Board of Trustees finds that ACP applications meet the requirements of Section 10. 1-1704, VOF staff would recommend the following conditions:
>
> - Issuance of a Certificate by FERC and all other necessary state and federal permits for the proposed ACP route crossing this easement.
> - VOF approval and sign off of final right-of-way easement permitting only a 50-foot-wide easement for one 42-inch-diameter underground natural gas pipeline and the associated permanent access road easement. No

above-ground structures are permitted within this permanent right-of-way except for above ground pipeline markers as required by law.

- Atlantic transfer of fee-simple interest to VOF of the proposed 1,034-acre Hayfields Farm Property and Rockfish River Parcel as Substitute Land for the converted areas of the open-space easement property.

- The acceptance of funds from Atlantic to: (i) serve as a Stewardship Fund to support the VOF with the operation and management of the substitute properties, and (ii) partially offset the VOF's unreimbursed costs associated with the ACP.

- Written requests from both the VOF and Atlantic to FERC to include the above stated requirements as conditions of the FERC approval.

Additional site-specific conditions may be developed with Atlantic representatives and the current landowner of the easement property such as minimizing the width or extent of the permanent easement and construction footprint where feasible, developing pollinator corridors, and restoring other natural habitat areas to help preserve the purpose of the open-space deed of easement (VOF, 2017).

We note that, as discussed in section 4.8.2, pipeline operators must obtain easements from landowners and land-managing agencies to construct and operate natural gas facilities, or acquire the land on which the facilities would be located. As such, Atlantic and DETI would need to acquire long-term easements from the VOF to construct and operate the new project facilities on VOF-held easements. It is acknowledged that a VOF open-space easement limits present and future property development rights, and that activities such as establishing rights-of-way or other easements require advance notification and/or written approval from the VOF (VOF, 2016). However, these negotiations are between the landowner, VOF, and Atlantic. While FERC has disclosed the impacts of the project on these areas, the VOF would determine if the project is compatible with the goal of each easement crossed, would determine whether to approve or not approve Atlantic's permit request, and, as necessary, include the above-listed conditions as part of any permits or approvals.

U.S. Army Corps of Engineers

The AP-2 mainline in North Carolina would cross 0.2 mile of USACE project easements as listed in table 4.8.5-1. These easements allow for the maintenance and operation of various federally authorized navigation projects and provide the USACE with access or usage rights (USACE, 2016).

Based on Atlantic's correspondence with the USACE, Wilmington District's Real Estate Department, the purpose of each easement crossed by ACP is to maintain the waterbody (the Cape Fear and Neuse Rivers) for navigation (USACE, 2015). Utilities commonly cross waterbodies where a USACE easement exists and, as such, the project would not be prohibited from these areas; however, the utility right-of-way would be subject to navigation servitude and the federal government's power over waterways (USACE, 2015).

East Coast Greenway (planned)

Based on comments received on the draft EIS from the VDCR, ACP would cross the planned East Coast Greenway (VDCR, 2017a). The greenway at the pipeline crossing equates to U.S. Route 1 at AP-1 MP 267.7 (see table 4.8.5-1). The East Coast Greenway is a planned linear park located almost entirely along public rights-of-way to serve as a long-distance urban bicycle and walking route between Calais, Maine at the Canadian border, and Key West, Florida (East Coast Greenway Alliance, 2017).

Land uses on either side of the greenway at the crossing location along the AP-1 mainline consist of forest land and open land. Atlantic would avoid direct impacts on the greenway by crossing it using the bore crossing method, which is described in section 2.3.3.2. Users of the greenway would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Impacts associated with tree removal to accommodate construction equipment would be long-term to permanent where the operational right-of-way is maintained as open land. Recreational uses of the greenway would not be affected by operation of the project.

Beaches to Bluegrass Trail (planned)

Based on comments received on the draft EIS from the VDCR, ACP would cross the planned Beaches to Bluegrass Trail (VDCR, 2017a). The trail at the pipeline crossing equates to the Norfolk and Western Railroad at AP-3 MP 54.6 (see table 4.8.5-1). The Beaches to Bluegrass Trail is a proposed statewide shared-use path and multi-use trail that is intended to connect communities between the Virginia Beach oceanfront and Cumberland Gap and provide for increased opportunities to walk, bike, and ride horseback (VDCR, 2017b).

Land use on either side of the trail at the crossing location along the AP-3 mainline consists of forest land. Atlantic would avoid direct impacts on the greenway by crossing it using the bore crossing method, which is described in section 2.3.3.2. Users of the trail would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Impacts associated with tree removal to accommodate construction equipment would be long-term to permanent where the operational right-of-way is maintained as open land. Recreational uses of the trail would not be affected by operation of the project.

4.8.5.3 North Carolina

Roanoke River Paddle Trail

At AP-3 MP 9.8, ACP would cross the Roanoke River Paddle Trail, a water-based trail that runs through public waters and is available to canoers, kayakers, and boaters (Roanoke River Partners, 2016a); established by a non-profit group called the Roanoke River Partners and is the first private system of its type in the nation (Roanoke River Partners, 2016b).

Atlantic would cross the river trail using the HDD method. A site-specific crossing plan showing the HDD crossing is included in appendix H. Similar to other features crossed using this method, direct impacts would be avoided and use of the river would continue throughout construction. Recreationalists would experience temporary visual and noise impacts associated with construction personnel and equipment and HDD activities. Also, some minor hand cutting of brush to lay a guide wire for the HDD may be necessary between the HDD drill entry and exit points. This would consist of a pathway measuring about 2 to 3 feet wide in thickly vegetated areas. This impact would be temporary to short-term and negligible. Recreational uses of the river trail would not be affected by operation of the project.

State Highway 561 Byway

Atlantic's AP-2 mainline would cross State Highway 561 in Halifax County, North Carolina (see table 4.8.5-1). State Highway 561 is one of several state scenic byways associated with Lafayette's Tour, which runs between Henderson and Lynch's Corner (North Carolina Department of Transportation

[NCDOT], 2016). The byway takes motorists through several communities visited by French General Marquis de Lafayette during his 1825 tour of the United States (NCDOT, 2016).

Land uses on either side of the scenic byway crossing location consists of forest and agriculture. Atlantic would avoid direct impacts on the scenic byway by using the bore crossing method, which is described in section 2.3.3.2. Scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Recreational uses of the scenic byway would be allowed to continue throughout project operation. Visual impacts on users of the scenic byway are discussed in section 4.8.8.

Devils Racetrack Road, North Carolina Byway (Road 1009)

Atlantic's AP-2 mainline would cross Devils Racetrack Road, a North Carolina Byway, in Johnston County, North Carolina (see table 4.8.5-1). Devils Racetrack Road is one of several byways associated with the Blue-Gray Scenic Byway, which runs between Exit 90 off Interstate 95 to the south side of Trenton (NCDOT, 2016). The byway takes motorists through several Civil War communities and battlefield sites (NCDOT, 2016).

Land uses on either side of the scenic byway crossing location consists of agriculture. Atlantic would avoid direct impacts on the scenic byway by using the bore crossing method, which is described in section 2.3.3.2. Scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Recreational uses of the scenic byway would be allowed to continue throughout project operation. Visual impacts on users of the scenic byway are discussed in section 4.8.8.

North Carolina Ecosystem Enhancement Program Easements

Atlantic's AP-3 lateral would be located within 0.25 mile of several North Carolina Ecosystem Enhancement Program (NCEEP) easements in Northampton County, North Carolina (see table 4.8.5-1). The NCEEP is a North Carolina Department of Environment and Natural Resources (now referred to as the NCDEQ) initiative where the NCEEP and landowners work collaboratively to protect, improve, and repair wetlands and waterways while offsetting unavoidable environmental damage from economic development. Landowners enrolled in the NCEEP may retain ownership of their property through a voluntary conservation agreement or sell or donate all or part of the property to the state (NCDEQ, 2016a).

Where the AP-3 lateral would be within 0.25 mile of a conservation easement, noise and visual impacts would occur during construction; however, these would be temporary and limited to the time of construction. During operation, moderate and permanent visual impacts would result from tree clearing within the nearby permanent right-of-way. Construction and operation of the project would not directly affect conservation uses of the easements.

4.8.5.4 Nationwide Rivers Inventory

The federal government identifies outstanding waters under both the NRI (NPS, 2011) and National WSR System. The NRI is a listing of free-flowing river segments that are identified as having at least one ORV. Federal agencies must avoid or mitigate actions that have the potential to negatively impact any listed segments, and consult with the NPS' Rivers, Trails and Conservation Assistance Program prior to taking any actions that may preclude the future designation of wild, scenic, or recreational status of rivers on the NRI. The 1968 National Wild and Scenic Rivers Act (Public Law 90-542; 16 U.S.C. 1271 et seq.) identifies rivers as having exceptional natural, cultural, and recreational values and seeks to preserve them for enjoyment of present and future generations (National Wild and Scenic River System, 2016).

Based on consultation with the NPS, no WSR-listed waterbodies would be crossed by ACP or SHP, and no-NRI-listed waterbodies would be crossed by SHP. ACP would cross 17 waterbodies within a section of river listed on the NRI (see table 4.8.5-3). These waterbodies are listed with ORVs related to scenic, recreation, fish, geologic, cultural, historic, wildlife, botanic, and wild. During our review of the Master Waterbody Crossing table for ACP filed by Atlantic on May 8, 2017, we noted that the crossings of the Black River and Little Marsh Swamp identified in table 4.8.5-3 were missing. We recommend in section 4.6.1 that Atlantic provide an updated Master Waterbody Crossing table that includes these crossing locations.

TABLE 4.8.5-3

Nationwide Rivers Inventory Rivers Crossed by the Atlantic Coast Pipeline [a]

Facility/County, State or Commonwealth	Waterbody Name	Milepost	Outstandingly Remarkable Values	Proposed Crossing Method [b]
AP-1 Mainline				
Upshur, WV	Buckhannon River	31.7	Recreation	Cofferdam
Pocahontas, WV	Greenbrier River	76.6	Recreation, Fish	Cofferdam
Highland, VA	Back Creek	87.2	Geologic, Cultural	1) Cofferdam 2) Dam and Pump
Bath, VA	Cowpasture River	97.8	Scenic, Recreation, Historic	1) Cofferdam 2) Dam and Pump
Nelson and Buckingham, VA	James River	184.7	Scenic, Recreation, Geologic, Historic, Botanic	HDD
Buckingham, VA	Slate River	197.9	Geologic	1) Dam and Pump 2) Flume
Buckingham, VA	Willis River	205.1	Historic	1) Dam and Pump 2) Flume
Cumberland and Prince Edward, VA	Appomattox River	220.8	Historic, Wild	Cofferdam
Nottoway, VA	Deep Creek	236.0	Wild	1) Dam and Pump 2) Flume
Brunswick and Dinwiddie, VA	Nottoway River [c]	260.7	Botanic	Cofferdam
Greensville, VA	Meherrin River	286.3	Wild	Cofferdam
AP-2 Mainline				
Halifax and Nash, NC	Fishing Creek	33.9	Scenic, Recreation, Geologic, Fish, Wildlife, Historic, Cultural	HDD
Nash, NC	Tar River	59.4	Scenic, Recreation, Geologic, Fish, Wildlife, Historic, Cultural	HDD
Johnston, NC	Neuse River [c]	98.5	Scenic, Recreation, Geologic, Fish, Wildlife, Historic, Cultural	Cofferdam
Cumberland, NC	Black River	124.5	Scenic, Recreation, Geologic, Fish, Wildlife, Historic, Cultural	1) Dam and Pump 2) Flume
Robeson, NC	Little Marsh Swamp	162.4	Scenic, Recreation, Fish, Wildlife	1) Dam and Pump 2) Flume
AP-3 Lateral				
Southampton, VA	Nottoway River	32.6	Botanic	HDD

[a] SHP would not cross or affect waterbodies listed on the NRI.

[b] Where multiple methods are shown, Atlantic may adopt either method, depending on waterbody conditions at the time of crossing. Both methods listed would result in similar impacts.

[c] As stated in sections 4.7.1.8 and 4.7.1.10, we have recommended that Atlantic complete an HDD crossing of these waterbodies should a hydrofracture analysis determine there is a low potential for an inadvertent return.

The CEQ promulgated procedures for interagency consultations to avoid or mitigate adverse effects on rivers listed on the Nationwide Inventory: Procedures for Interagency Consultation to Avoid or Mitigate

Adverse Effects on Rivers in the Nationwide Inventory (CEQ, 1980). The CEQ procedures allow the environmental document that discloses potential impacts on rivers listed on the Nationwide Inventory to constitute consultation with the NPS. We sent the NPS a copy of our NOIs issued for ACP and SHP, and the NPS responded on April 28, 2015, but did not mention rivers on the Nationwide Inventory in its letter to the FERC. A copy of the draft EIS was sent to the NPS and no comments were received specific to NRI. The NPS also received a copy of this final EIS.

An assessment of impacts on the waterbodies listed in table 4.8.5-3 and measures that would be implemented to avoid, reduce, or mitigate those impacts is provided in section 4.3.2. While construction would have temporary and short-term impacts on waterbodies, use of Atlantic's and DETI's construction and restoration plans (see table 2.3.1-1) would minimize those impacts to non-significant levels. ACP and SHP should not have long-term adverse effects on segments of rivers listed on the NRI.

4.8.5.5 Rockfish Valley

Rockfish Valley is located within Nelson County, Virginia and ACP would generally cross it between approximate AP-1 MPs 158 and 165. Commenters expressed concern that the project would adversely affect many environmental resources, including cultural and historic issues; reduce food, shelter, and habitat for birds, wildlife, and butterflies; and diminish the enjoyment of the trail visitors because of the reduction of animal life they see. This discussion focuses on the recreation and special interest areas affected by the project within the Rockfish Valley. Section 4.10.1.1 addresses historic and archaeological sites and the South Fork Valley Rural Historic District, including Elk Hill Farm. Sections 4.3, 4.4, 4.5, and 4.6 address waterbodies and wetlands, vegetation, wildlife, and aquatic resources respectively, affected by ACP.

Cultural, environmental, and historic resources within Rockfish Valley are managed by the Rockfish Valley Foundation. The foundation, which was founded in 2005, works to "preserve the natural, historical, ecological and agricultural resources of the Rockfish Valley…The mission further supports conservation, recreation, preservation and environmental education and promotes a rural tourism experience in the Rockfish Valley of Nelson County, Virginia."

Within the Rockfish Valley area at AP-1 MP 163.3, the proposed route would cross about 600 feet of the southern portion of Spruce Creek Park and the Rockfish Valley Trail, which wraps around the perimeter of the Spruce Creek Park. The project would also be near the Butterfly Trail and a future trail, about 800 feet south of the Wintergreen Country Store, and about 600 feet north of Elk Hills Baptist Church (Rockfish Valley Foundation, 2016a). The Rockfish Valley Foundation has also established a 50-mile-long scenic loop drive called the Nelson Scenic Loop, which runs along four scenic byways including Route 151 (crossed by project), Route 664, the BRP (crossed by project), and Route 56. Crossings of the scenic byways and road trails associated with the Nelson Scenic Loop are discussed in section 4.8.5.2. Based on information from the Rockfish Valley Foundation, the project would also cross a vernal pool that has been the subject of a written study (Rockfish Valley Foundation, 2016b).

As discussed in section 3.4.1, we analyze the Spruce Creek Route Variation. While this route variation would avoid Spruce Creek Park and the Rockfish Valley Trail, it would result in crossings of the Reids/Glenthorne, Rockfish, and Beech Grove trails, as well a future trail. The Spruce Creek Route Variation is discussed further in section 3.4.1.

Atlantic would cross the park, including the future Butterfly Trail, using conventional construction methods. Atlantic would cross the Rockfish Valley Trail using the bore method, which is described in section 2.3.3.2. Similar to other areas crossed using the bore method, direct impacts on the feature would be avoided. Scenic travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Impacts would be the same as those described in section 4.8.1.1 specific to the land use affected. Recreational uses of the valley, park, and trails would be allowed to continue during project operation.

4.8.5.6 Civil War Battlefield Sites

ACP would cross portions of eight Civil War battlefield sites on private land, as listed in table 4.8.5-4. The following discusses the general aspects of the battlefields. Potential project-related impacts on historic resources (including assessment under section 106 of the NHPA) associated with the battlefields is discussed in section 4.10.1.1.

TABLE 4.8.5-4

Private Civil War Battlefield Sites Crossed by the Atlantic Coast Pipeline

Facility/County or City, State or Commonwealth	Site Name/Feature	Begin Milepost	End Milepost	Crossing Length (feet)	Area Affected by Construction (acres)
AP-1 Mainline					
Highland, VA	McDowell	113.6	113.7	1,338	28.2
Cumberland, VA	Cumberland Church	215.2	216.0	4,077	13.8
Cumberland, VA	High Bridge Battlefield	222.5	222.8	1,480.5	5.6
Prince Edward, VA	Sayler’s Creek	221.3	224.8	1480.5	6.2
Prince Edward, VA	Rice’s Station	224.3	224.8	1,917.3	8.6
AP-2 Mainline					
Johnston, NC	Bentonville	100.7	100.8	425	1.5
Johnston and Harnett, NC	Averasborough	129.7	130.0	1,817	5.8
AP-3 Lateral					
City of Suffolk, VA	Suffolk II				
	Study area	50.5	50.7	1,231	2.9
	Core area	62.5	65.4	15,497	39.6
	Core area	66.0	66.1	632	1.8
	Study area	66.0	66.1	31.6	0.3
	Study area	66.1	66.1	155	0.5
	Core area	66.1	66.3	715	1.9

As summary of each battlefield is provided below.

- McDowell Battlefield – The AP-1 mainline would cross 0.3 mile of battlefield associated with the Battle of McDowell in Highland County, Virginia. The Battle of McDowell occurred on May 8, 1862 and was one of Confederate General Stonewall Jackson’s engagements associated with the Shenandoah Valley Campaign (NPS, 2016b). The McDowell Battlefield is one of 20 battlefield sites designated in 1996 as part of the Shenandoah Valley Battlefields National Historic District, which consists of eight counties in the Shenandoah Valley of Virginia (Shenandoah Valley Battlefields, 2016). The area crossed is associated with a segment of the battlefield site used for troop movement and supply.

- Cumberland Church Battlefield – The AP-1 mainline would cross 0.8 mile of battlefield study area associated with the Battle of Cumberland Church in Cumberland County, Virginia. The Battle of Cumberland Church occurred on April 7, 1865 at which Confederate General Robert E. Lee’s troops repulsed two Union Army attacks (NPS, 2016c). The Battle of Cumberland Church has been characterized as the Confederate Army of Northern Virginia’s last victory of the Civil War (Salmon, 2001). The AP-1 mainline lies about 0.5 mile north of the battlefield core area, which includes the Cumberland Church.

- High Bridge Battlefield – The AP-1 mainline would cross 0.3 mile of the site of the High Bridge Battlefield. This battle is one of several fought in Cumberland and Prince Edward counties as part of the Appomattox Campaign near the end of the Civil War. There was fierce back and forth fighting over control of the high bridge crossing the Appomattox River near Farmville. On April 7, 1865, the Union Army gained control of the wagon bridge and pursued the confederates to Cumberland Church, the site of the Civil War's last battle.

- Sayler's Creek Battlefield – The AP-1 mainline would cross 0.7 mile of battlefield associated with the Battle of Sayler's Creek in Prince Edward County, Virginia. The Battle of Sayler's Creek occurred on April 6, 1865 and was the last battlefield encounter between Union General Ulysses S. Grant and Confederate General Robert E. Lee before Lee's surrender at Appomattox Court House (NPS, 2016d; Salmon, 2001).

- Rice's Station Battlefield – The AP-1 mainline would cross 0.5 mile of battlefield identified with the Rice's Station Battle. Fought on the same day as the Sailor's Creek Battle, the Rice's Station Battle was a minor skirmish whereby Major General John Gibbon confronted Confederate Lieutenant General James Longstreet's troops as they were setting up defensive trenches near the Rice railway station. By this time in the war, the Union Army outnumbered the Confederate Army, which was running out of supplies and options, and the war was nearing its conclusion.

- Bentonville Battlefield – The AP-2 mainline would cross 425 feet of battlefield associated with the Battle of Bentonville in Johnston County, North Carolina. The Battle of Bentonville was fought over a 3-day period, between March 19 and 21, 1865, and was the final clash between William T. Sherman's and Confederate General Joseph E. Johnston's armies (North Carolina Historic Sites, 2016).

- Averasborough Battlefield – The AP-2 mainline would cross 0.3 mile of battlefield associated with the Battle of Averasborough. The Battle of Averasborough occurred on March 16, 1865, at which Lieutenant General William Hardee's Confederate forces repulsed several Union attacks before retreating (NPS, 2016e; Civil War Trust, 2016).

- Suffolk II Battlefield – The AP-3 lateral would cross a total of 3.5 miles of battlefield study and core area associated with the Battle of Suffolk, also called the Siege of Suffolk, around the City of Suffolk, Virginia. The Battle of Suffolk occurred between April 11 and May 4, 1863 at which Confederate Lieutenant-General James Longstreet laid siege to a Union garrison at Suffolk, withdrawing to re-join General Robert E. Lee's forces after a month of fighting, but also protecting the City of Richmond in the process (NPS, 2016f; Cormier, 1989). The AP-3 lateral would cross 0.3 mile of two study areas and 3.2 miles of battlefield core area. The crossings of the core areas mostly occur adjacent to existing rights-of-way and/or in agricultural areas.

Atlantic would cross these areas using conventional construction methods, as described in section 2.3.2. Based on a review of aerial photography and Atlantic's field surveys, ACP would not affect any visitor facilities, interpretive signs, or markers associated with the battlefields. Construction and operation impacts on each site would be the same as that described in section 4.8.1.1, depending on the land use type(s) crossed. Following construction, the battlefields would continue to function as a historic and recreational resource.

4.8.6 Coastal Zone Management Act

The CZMA is intended to "preserve, protect, develop, and where possible, to restore or enhance" the nation's coastal zone (16 U.S.C. 1452, Section 303 (1) and (2)). To participate in the Coastal Zone Management Program, a state/commonwealth is required to prepare a management plan for approval by the U.S. Department of Commerce, NOAA, OCM. Once the OCM approves a plan, the state/ commonwealth program gains "Federal Consistency" or jurisdiction. This means that federal actions (including actions requiring federally issued licenses or permits) that take place within a state's/ commonwealth's coastal zone must be found to be consistent with state/commonwealth coastal policies before the federal action can take place.

Based on a review of the West Virginia and North Carolina Coastal Zone Management Programs' Coastal Zone Maps, ACP and SHP fall outside of the geographical boundaries of the West Virginia and North Carolina coastal zones and, therefore, are not subject to coastal zone consistency review in West Virginia and North Carolina (NOAA, 2012). Portions of ACP in Virginia, however, are within a coastal zone, as discussed further below (VDEQ, 2016a).

The coastal zone area crossed by the proposed AP-3 lateral route in Virginia includes 29.5 miles within the City of Suffolk and 11.2 miles within the City of Chesapeake. The project would also include the placement of the Elizabeth River M&R Station; valves 27, 28, 29, and 30; and a pig receiver at AP-3 MP 79.3 within the designated coastal zone area. Also, about 5 miles of new permanent roads would occur in the designated coastal zone to access aboveground facilities during operations.

The VDEQ's Coastal Zone Management Program oversees coordination and review of the coastal zone consistency determination process with input from the coastal planning district commission, local governments, and other Commonwealth agencies (VDEQ, 2016a). Atlantic submitted its Consistency Certification to the VDEQ in September 2015.

To ensure the project is consistent with the CZMA, **we recommend that:**

- **<u>Prior to construction</u>, Atlantic should file with the Secretary documentation of concurrence from the VDEQ that ACP is consistent with the CZMA.**

As listed in section 5.2, Atlantic is required to file documentation verifying it has received all applicable authorizations required under federal law.

4.8.7 Contaminated Sites

Based on a review of federal and state regulatory databases to identify known and potential water and soil contamination, landfills, and hazardous waste sites with proximity to the project, several sites of potential contamination were identified in the project area (EPA, 2014; WVDEP, 2013, 2014a, 2014b; VDEQ, 2014b; NCDEQ, 2014a, 2014b, 2014c; PADEP, 2014). Sites identified include the following:

- Seven active CERCLIS and ACRES Sites within 1 mile of the AP-2 mainline and AP-3 lateral, the closest of which is 54 feet south of AP-3 MP 82.4 and referred to as the Borden Smith Douglass Site. Two sites are upgradient, four sites are downgradient, and one site is side gradient of ACP.

- One RCRA corrective action site, the Roysters Co, is located 2,437 feet north of the AP-3 lateral at MP 81.5. The site is closed, and downgradient of the project.

- One formerly used defense site, the St. Julien's Creek Annex, is located 3,000 feet north of the AP-3 lateral at MP 81.2. The site is active and downgradient of the project.

- Six total Landfill and Solid Waste Sites within 0.5 mile of the AP-1 mainline and AP-3 lateral. All sites are over 300 feet from the pipelines. Two sites have an open status; one is upgradient but is downgradient of ACP. The remaining are closed (site has been remediated and/or contamination does not pose an unacceptable risk to human health or the environment (see table 4.3.1-3)).

- Thirty-three LUST Sites within 1,000 feet of the AP-1 mainline, AP-2 mainline, and AP-3 lateral. The closest site is 50 feet north and upgradient of AP-1 MP 115.0. All other sites are located over 180 feet from ACP. Three sites have an open status, of which one is upgradient but over 900 feet away. The remaining sites are closed.

None of the known sites would be crossed by the pipeline centerline and would not be directly affected by trenching. Sites up and/or side gradient of the project could result in runoff into the project trench and workspace areas. In addition to the Borden Smith Douglass Site, which is discussed in more detail below, the three nearest sites with an open designation that are up and/or side gradient of the project consist of the Jolivue Landfill, a landfill site located 915 feet northeast of AP-1 MP 144.5 in Augusta County, Virginia; Plainview Grocery, a LUST site located 965 feet southeast of AP-2 MP 118.7 in Sampson County, North Carolina; and Chesapeake Energy Center, a LUST site located 755 feet south of AP-3 MP 81.6 in the City of Chesapeake, Virginia. Due to their distance from the proposed facilities, it is unlikely that contaminated groundwater or sediment from these sites would be encountered during construction of ACP. However, should contaminated media (i.e., soil or groundwater) be encountered during construction, Atlantic and DETI would implement its *Contaminated Media Plan*. As outlined in the plan, the contractor(s) would stop work in the area; restrict access to the site; and notify the crew foreman, an EI, the Spill Coordinator, Atlantic and DETI personnel, and the site's landowner. The contractor would contain the contaminant and collect samples of the soil or groundwater for analysis. Depending on the results of the analysis, a route variation to avoid the site would be considered or a site-specific plan for completing construction within the contaminated area would be prepared in accordance with applicable environmental regulations and in coordination with the appropriate agency(ies). Any soil verified as contaminated would not be placed back into the trench unless approved by the appropriate agency(ies). We reviewed Atlantic's and DETI's *Contaminated Media Plan* and find it acceptable.

We received comments on the draft EIS from the VDEQ regarding the *Contaminated Media Plan* requesting that the following mitigation measures be added to the plan:

- Section 5.0: It is recommended that EIs be provided more specific training and proper field equipment for analyses of soils and sediment and groundwater contamination.

- Section 6.0: It is recommended that all potentially contaminated soil is managed in accordance with all applicable federal, state, and local laws and regulations. Additional recommendations for managing contaminated media would be to initially test representative soil and groundwater samples for the expected contaminant class based on the current or previous source. A phase I assessment of past land use of the contaminated area discovered would allow testing for the appropriate analysts.

- Section 7.0: It is recommended that, to address situations where contamination found to be a health or safety hazard, the area be evacuated until trained personal are on-site and the appropriate federal, state, or local agency(ies) contacts are identified.

- In addition to the *Contaminated Media Plan*, it is recommended that Atlantic and DETI develop a waste and debris management plan for using all excess material and debris in accordance with all applicable federal, state, and local laws and regulations.

While we generally agree with these recommendations, we realize they might not apply to all project areas and/or not be appropriate in all situations. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a finalized *Contaminated Media Plan* that considers the recommendations included in the VDEQ's letter dated April 6, 2017 (Accession No. 20170406-5489). As appropriate, provide evidence of consultations with the VDEQ regarding its comments on the *Contaminated Media Plan*.**

One site is located less than 50 feet from the construction centerline: the Borden Smith Douglass site at AP-3 MP 82.4 in Chesapeake City, Virginia. While the site would not be directly affected by trenching activities, the site limits are within the 125-foot-wide construction right-of-way. The Borden Smith Douglass site is discussed further below.

Borden Smith Douglass Site

The Borden Smith Douglass Site is classified as a Brownfield site based on a review of CERCLIS and ACRES databases. Based on Atlantic's correspondence with the EPA and VDEQ, the Borden Smith Douglass site is located near the southwest corner of the intersection of Military Highway and Bainbridge Boulevard in Chesapeake City, Virginia. The site is owned by Pivotal Propane of Virginia, Inc. (Pivotal) and is currently enrolled in the VDEQ's Voluntary Remediation Program (VRP). The approximately 53-acre site is divided into three parcels: Parcels 1, 2, and 3. Parcels 1 and 3 are currently undeveloped; Parcel 2 contains a propane peak shaving facility. The AP-3 lateral would cross Parcel 2 for about 1,300 feet and Parcel 3 for about 750 feet.

The Borden Smith Douglass Site was developed in the late 1920s as a phosphate fertilizer plant by Smith Douglass and continued to manufacture and produce phosphate-based fertilizer products into the early 1980s. Portions of the site were also leased to various small-scale operations including truck repair, electrical service, and other commercial activities. In the early 1980s the site was sold as three separate parcels to Steuart Investment Company (Steuart) and then, in 2004, Pivotal purchased all three parcels. It was at this time the site was enrolled in the VRP. Pivotal completed demolition of all on-site buildings, foundations, and utilities and removed railroad tracks within the parcels in preparation for development.

As a result of soil and groundwater quality investigations conducted by the EPA in the mid-1980s and Environmental Site Assessments in the 1990s, an Administrative Order on Consent between Smith Douglass Borden, Steuart, and the EPA was established. The consent order required the remediation of dioxin impacted soil near a manufacturing building on the site. The dioxin impacted soil was stored inside a building onsite for several years until it was disposed of off-site in 1995, when compliance with the terms of the consent order was completed. As a result, the site is listed on the CERCLIS as "No Further Remedial Action Planned" and does not does not qualify for inclusion on the National Priority List (also known as the EPA's list of Superfund sites). A Memorandum of Agreement (MOA) exists between the EPA and

VDEQ regarding contaminated sites managed under the VRP and, specific to the Smith Douglass Borden site, the EPA has not been involved in the management of the site.

In 2004, a Phase II Environmental Site Assessment was conducted at the site and low pH in soil and groundwater in the southeast and north-central areas of Parcel 2 were identified, which could pose risk to workers through dermal exposure. Additionally, inorganics (metals) were detected in groundwater within Parcels 1 and 2 at concentrations that exceed the Virginia VRP Tier 3 criteria, indicating a potential risk.

In May 2015, Pivotal submitted to the VDEQ a Draft Demonstration of Completion Report, Draft Public Notice, and Draft Certificate of Satisfactory Completion of Remediation (Draft Certificate) for the Borden Smith Douglass site. The following proposed institutional controls/deed restrictions are included in the Draft Certificate:

- Groundwater beneath the site (Parcels 1, 2, and 3) shall not be used for any purpose other than environmental monitoring and testing.
- The site (Parcels 1, 2, and 3) shall not be used for residential purposes or for children's daycare facilities, schools, or playground purposes (although hotels and motels are not prohibited).
- For Parcel 1, excavations with the potential to encounter groundwater (greater than 5 feet in depth) must be conducted in accordance with a Site Operations Plan (SOP).
- For Parcel 2, excavations into soil and groundwater to any depth must be conducted in accordance with the SOP.

The Draft Certificate contains a copy of the SOP, which details the Operational Requirements for excavations to depths greater than 5 feet within Parcel 1 and for excavations or ground disturbances within Parcel 2 of the site. The specified Operational Requirements include plans and procedures related to worker safety and soil and groundwater disposal management. As of November 2016, the SOP has been reviewed and approved by the VDEQ and a draft Institutional Controls for the site is pending.

The site is currently undergoing final site closure within the VDEQ VRP. Based on Atlantic's correspondence with the VDEQ, installation of ACP would not preclude final site closure efforts and would not lead to the spread of contaminated material during construction provided construction is completed in accordance with the SOP (VDEQ, 2016b), to which Atlantic has committed. Atlantic would coordinate with Pivotal regarding implementation of the SOP in connection with excavation or ground disturbances associated with the project, and would comply with the Operational Requirements specified in the Certificate of Satisfactory Completion of Remediation, when issued by the VDEQ. As discussed above, should contaminated media (i.e., soil or groundwater) be encountered during construction, Atlantic and DETI would implement its *Contaminated Media Plan*.

4.8.8 Visual Resources

"Visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for residents or visitors. ACP and SHP would cross federal, state, county, and privately owned lands that encompass a wide range of visual resources and landscapes. Regulations and guidelines that have been established to protect visual resources, as well as project impacts, on federally owned lands crossed by the proposed ACP and SHP are described separately in section 4.8.9.

4.8.8.1 Existing Visual Character and Condition

The existing visual landscapes crossed by the proposed pipelines can be characterized by the physiographic provinces that they cross. Physiographic provinces represent regions in which the climate and geology have produced different landforms, and can help define the visual landscape. ACP and SHP would be located in five physiographic provinces:

- Appalachian Plateau Province between approximate AP-1 MPs 0 and 74 and the entire SHP;
- Ridge and Valley Province between approximate AP-1 MPs 74 and 148;
- Blue Ridge Province between approximate AP-1 MPs 148 and 169;
- Piedmont Province between approximate AP-1 MPs 169 and 300; AP-2 MPs 0 and 7 and MPs 37 and 42; AP-3 MPs 0 and 1; and the entire length of the AP-4 and AP-5 laterals; and
- Atlantic Coastal Plain Province between approximate AP-2 MPs 7 and 37 and MPs 42 and 183; and AP-3 MPs 1 and 79.

The Appalachian Plateau Province in West Virginia is characterized by an eastern deciduous forest, dominated by northern hardwoods and interspersed with pines and other conifers. The Ridge and Valley Province in West Virginia begins east of the Appalachian Plateau Province and extends into Virginia and contains long, linear valleys and intervening sharp ridges, springs, and caves. The ridges are generally well forested with hardwood trees with hemlock and spruce occurring at higher elevations. The remaining areas consist of agricultural and developed lands. The Blue Ridge Province is located southeast of the Ridge and Valley Province and is characterized by narrow ridges and hilly plateaus to large rugged mountainous areas with high peaks and forested slopes containing oak forests, northern hardwoods, and spruce-fir forests. The Shenandoah Valley extends east approximately 200 miles between the Allegheny and Blue Ridge Mountains and occurs within the Blue Ridge Province. The Piedmont Province is characterized by a gently rolling landscape that consists primarily of cultivated fields, pasture, and forest. Lastly, the Atlantic Coastal Plain Province is characterized by low-relief topography that has been highly modified by residential development. ACP would cross primarily agricultural and forested areas of the province. Additional visual elements along the proposed pipeline corridor include rivers and streams, buildings and houses, paved and unpaved roads, electric transmission lines, communication towers, and fences.

Visual resource management standards and regulations have been established to protect existing visual resources on some federally, state-, and county-owned lands. Privately owned lands crossed by the projects are not subject to federal or state visual resource management standards or regulations. Approximately 577 miles (96 percent) of ACP and approximately 34 miles (90 percent) of SHP would be constructed across privately owned lands (see table 4.8.2-1).

Generally, counties and municipalities affected by ACP and SHP identify the preservation of scenic values as important to their community; however, most affected county and municipal land planning agencies do not include specific regulations in ordinances for scenic areas, or utilize visual design guidelines. Based on review of existing county Comprehensive Land Use Plans, Bath County, Virginia is the only county that has specifically established land use objectives to protect or conserve visual resources on county-owned lands. Bath County has a land use objective to "Preserve and protect the water quality, scenic beauty, and natural character of the Cowpasture River, Jackson River and Back Creek by implementing Best Management Practices." Bath County has also considered revising its current Zoning

Ordinance in the future to include measures that would "protect water quality, ridgetops, viewsheds, dark skies, and soil quality" (Bath County, 2014). Additional discussion of the measures Atlantic would implement during construction and restoration at the Cowpasture River, Jackson River, and Back Creek are provided in section 4.3.2.

We received comments on the draft EIS regarding the protection of visual resources within the counties crossed by the pipeline corridor. Although we acknowledge that the preservation of scenic values is identified as goals in some county comprehensive land use plans, these areas do not have specific requirements in their zoning ordinances to classify or protect visual resources or require adherence to specific visual design guidelines.

4.8.8.2 Pipeline Facilities

Visual changes and the degree of visual impacts are based on the quality of the existing landscape, types of vegetation and landforms, topography and elevation, the location of sensitive viewpoints, viewer travel direction and distance, the width of the temporary and permanent rights-of-way, and the duration of impact. ACP and SHP could alter existing visual resources in three ways: 1) construction activity and equipment may temporarily alter the viewshed; 2) lingering impacts along the right-of-way from clearing during construction could alter existing vegetation patterns; and 3) aboveground facilities would represent permanent alterations to the viewshed.

Temporary visual impacts from ACP and SHP would result from the construction and clearing of the pipeline right-of-way, ATWS, pipe storage and contractor yards, and project access roads. Section 4.8.1 describes the land requirements for construction of ACP and SHP. The construction right-of-way for ACP would vary between 75 feet and 150 feet (see section 2.2.1), which would be reduced to 75 feet in sensitive wetlands and waterbodies and ecologically sensitive areas of the MNF and GWNF (see section 4.8.9). The construction right-of-way for SHP would typically be 100 feet wide. Following construction, ACP has proposed to maintain a 50-foot-wide permanent right-of-way; Atlantic would maintain a 50-foot-wide long-term right-of-way on the MNF and GWNF in accordance with FS regulations.

Construction activities such as clearing and grading, trenching, excavation, spoil storage, and road modification would result in about 12,000 acres of temporary disturbance due to the removal of existing vegetation and trees, and disturbance of soils. Construction vehicles, heavy equipment, and project personnel would all be visible during project construction. These activities would affect views of the existing landscape for viewers near the construction yards and pipeline right-of-way and in areas where the pipeline is located adjacent to residential areas, along roadways, and near recreation areas. Construction-related impacts on views from these areas would be of short duration (generally 6 to 12 weeks), decrease with viewer distance, and limited to the period of active construction. In most land uses, ACP and SHP would not result in significant or long-term visual impacts because the pipeline would be installed below ground and the right-of-way and ATWS would be restored and revegetated after construction according to Atlantic's and DETI's *Restoration and Rehabilitation Plan*.

Atlantic and DETI collocated portions of the proposed pipeline facilities with existing infrastructure to reduce visual impacts along the corridor. In total, approximately 77.0 miles (13 percent) of ACP pipeline and 11.5 miles (31 percent) of SHP pipeline are parallel to existing cleared and/or previously disturbed linear corridor facilities including pipelines, electric transmission lines, roads, and railroads. Where existing and proposed rights-of-way would overlap, the removal of additional vegetation and disturbance of soils would be minimized compared to construction in greenfield areas. Collocation and construction of the pipeline would be consistent with the existing visual conditions in these areas and not contribute to additional significant visual impacts. Table 2.2.2-1 identifies by milepost the existing rights-of-way that would be paralleled by ACP and SHP.

ACP would cross about 60 miles of agricultural land including pasture and cultivated croplands, open lands, and developed lands including commercial and residential areas. These landscape areas are characterized as having low lying vegetation such as grasses and crops, lower elevations, and previous ground disturbance associated with agricultural farming activities and the development of residential areas and commercial structures. Visual conditions in these areas have been previously disturbed and modified; therefore, construction of the pipeline would be consistent with the existing visual conditions in these areas and contribute very minimal visual impacts. After construction, all disturbed areas would be revegetated and restored to previous conditions. Visual impacts on residences and commercial structures within 50 feet of construction work areas would be mitigated by avoiding the removal of visual screening trees and landscaping and promptly restoring lawns and landscaping (see section 4.8.3).

Pipeline construction would result in a greater degree of visual impacts in heavily forested areas with high elevations and along steep mountainsides. In West Virginia and northwestern Virginia, portions of the AP-1 mainline would be constructed in steep, mountainous terrain and require the removal of trees. Restoration and the establishment of vegetation in these areas typically takes several years to decades and re-planting trees in the right-of-way would be prohibited due to operational and safety concerns. The cleared and maintained permanent right-of-way in heavily forested areas would create a visual contrast more noticeable to viewers and result in a greater degree of visual impacts. Most heavily forested areas associated with the project are in remote, less populated areas where views of the cleared right-of-way would be intermittent. Impacts on scenery would be greatest where maintained herbaceous right-of-way on mountainsides and ridgetops with a predominant surrounding landscape character of intact forest canopy is viewed from valleys and adjacent mountains.

National Wild, Scenic, or Recreational Rivers

As described in section 4.8.5.4, the NPS maintains the NRI, a register of river segments that potentially qualify as National Wild, Scenic, or Recreational River areas (NPS, 2016a). Seven river segments on the NRI designated for their scenic values would be crossed by ACP. Table 4.8.8-1 describes the visual conditions at each designated NRI waterbody crossing. During our review of the Master Waterbody Crossing table for ACP filed by Atlantic on May 8, 2017, we noted that the crossings of the Black River and Little Marsh Swamp identified in table 4.8.8-1 were missing. We recommend in section 4.6.1 that Atlantic provide an updated Master Waterbody Crossing table that includes these crossing locations.

Atlantic would use the dam and pump, flume, and open-cut methods to cross the NRI river segments. As described in section 2.3.3.1, these methods would require tree and brush clearing for the construction right-of-way and ATWS and the use of heavy equipment. Visual impacts would be similar to the impacts of clearing for the pipeline right-of-way in agricultural, forest, and open land areas based on the scenic conditions listed in table 4.8.8-1.

At the James River crossing, Atlantic would use the HDD construction method, as described in section 2.3.3.2. The HDD method would avoid direct impacts on the waterbody and adjacent vegetation. Recreationalists would experience temporary visual impacts associated with construction personnel and equipment and HDD activities; however, use of the waterbody may continue throughout construction. Some minor hand cutting of brush to lay a guide wire for the HDD may be necessary between the HDD drill entry and exit points. This would consist of a pathway measuring about 2 to 3 feet wide in thickly vegetated areas. This impact would be temporary to short term and negligible.

TABLE 4.8.8-1

Visual Conditions at Nationwide Rivers Inventory Waterbodies Crossed by the Atlantic Coast Pipeline [a]

Waterbody Name	Milepost	Scenic Conditions	Proposed Crossing Method
Cowpasture River	AP-1 97.8	Thin strip of trees along each bank with surrounding agricultural fields and sparse areas of vegetation and trees, and roadway to the west	1) Cofferdam 2) Dam and Pump
James River	AP-1 184.7	Narrow corridor of trees along each bank, agricultural fields to the east and scattered patches of trees and an existing road to the west	HDD
Fishing Creek	AP-2 33.9	Moderately forested areas along each bank, agricultural fields to the north that are surrounded by patches of forested areas and agricultural fields to the south	HDD
Tar River	AP-2 59.4	Narrow forested band of trees along the south bank along with agricultural fields, wider forested areas along the north bank with a few patches of previously disturbed areas to the northeast	HDD
Neuse River	AP-2 98.5	Narrow band of dense trees along each bank with a block of previously disturbed land to the west and sparse vegetation to the east	Cofferdam
Black River	AP-2 124.5	Sparse patches of trees to the east and low-lying shrubs and vegetation to the west	1) Dam and Pump 2) Flume
Little Marsh Swamp	AP- 2 162.4	Shrubs and grasses along both banks and a patch of scattered trees to the east	1) Dam and Pump 2) Flume

[a] SHP would not cross or affect waterbodies listed on the NRI.

Atlantic would cross the waterbodies using the guidelines and measures outlined in the FERC *Procedures* to minimize impacts associated with the degree and extent of vegetation disturbance and the duration that heavy equipment would be in the area. Measures that would help maintain the river segments' designated scenic values and scenic viewshed include maintaining a 100-foot vegetation setback from the water's edge and locating extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge unless approved by the FERC. ACP would not result in significant or permanent visual impacts on NRI river segments. All disturbed areas would be restored according to Atlantic's and DETI's *Restoration and Rehabilitation Plan*.

State Scenic Rivers

The VDCR, Scenic Rivers Program designates scenic rivers and streams that possess outstanding scenic, recreational, historic, and natural characteristics of statewide importance. Although the program does not grant any special land use controls, state and federal agencies must consider how projects and programs affect state scenic rivers. Designation as a state scenic river in Virginia encourages protection and preservation of the river; declares the protection of a river's scenic values to be a beneficial purpose of water resource policy; and allows for lands along designated corridors to receive grant funds (VDCR, 2016d). Table 4.8.8-2 lists the designated and potential state scenic rivers crossed by ACP. ACP does not cross any state designated scenic rivers in West Virginia or North Carolina.

TABLE 4.8.8-2

Designated and Potential State Scenic Rivers Crossed by the Atlantic Coast Pipeline

Waterbody Name	Scenic Designation	Milepost	Scenic Conditions	Proposed Crossing Method
Cowpasture River	Potential	AP-1 97.8	Agricultural areas with a narrow band of riparian vegetation along each bank.	1) Cofferdam 2) Dam and Pump
Calfpasture River	Potential	AP-1 111.4; 112.2; 113.5; 116.7	Agricultural areas with a narrow band of riparian vegetation along each bank.	1) Dam and Pump 2) Flume
James River	Designated	AP-1 184.7	Narrow band of forested riparian trees and vegetation along each bank with adjacent agricultural areas.	HDD
Appomattox River	Potential	AP-1 220.8	Agricultural areas with a narrow band of riparian vegetation along each bank.	Cofferdam
Nottoway River	Potential	AP-1 260.7	Adjacent forested areas and previously disturbed/cleared land, narrow band of riparian vegetation along each bank.	Cofferdam
Nottoway River	Designated	AP-3 32.6	Densely forested bands along each bank.	HDD
Blackwater River	Designated	AP-3 38.6	Densely forested bands along each bank.	HDD
Meherrin River	Potential	AP-1 286.3	Forested areas along both banks with previously disturbed lands, roads, railroads, and cleared timber.	Cofferdam

As discussed previously, Atlantic would cross the James River using the HDD method. Similarly, Atlantic would also cross the Nottoway River and Blackwater River using the HDD method, which would avoid direct impacts such as in-stream work and vegetation clearing adjacent to the waterbodies. As such, construction and operation of ACP would not affect the scenic qualities associated with these designated waterbodies.

Due to existing disturbance near the river crossings (agricultural practices, timber clearing, etc.), construction activities would not cause a significant visual contrast or impact on the existing landscape. As requested by the VDCR, Atlantic would cross all waterbodies at a perpendicular angle except for the Meherrin River, which would be crossed at about 45 degrees due to a large wetland complex near the south side of the crossing. Following pipeline installation, all disturbed areas would be seeded and revegetated as soon as possible to reduce visual impacts from construction and in accordance with Atlantic's *Restoration and Rehabilitation Plan*.

Other Scenic Resource Areas

Lands managed under several other national and state scenic resource programs exist within the project area. Programs include state and national scenic byways, backways, and bikeways.

The National Scenic Byways Program is part of the DOT, FHA, which designates roads as National Scenic Byways or All-American Roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities. National Scenic Byways crossed by the AP-1 mainline include U.S. Highway 119/33 Staunton-Parkersburg Turnpike National Scenic Byway (crossed at AP-1 MP 23.2 in West Virginia and at AP-1 MP 114.8 in Virginia), and the BRP, which is discussed in section 4.8.9.2. Existing visual conditions at the Staunton-Parkersburg Turnpike National Scenic Byway at AP-1 MP 23.2 include structures and developed and previously disturbed areas on both sides of the crossing. The AP-1 MP 114.8 crossing of the scenic byway includes pasture lands on both sides of the crossing.

The Virginia Scenic Byways Program is managed by the VDOT in coordination with the VDCR. Scenic roadway designations include American Byways, Virginia Scenic Byways, and State Forest Scenic

Byways. The NCDOT manages scenic byways in North Carolina. ACP crosses 15 scenic byways in Virginia, 1 scenic byway in West Virginia, and 2 scenic byways in North Carolina. SHP does not cross any scenic byways. Existing visual conditions at the Virginia scenic roadway crossings include a mix of forest, pasture, cultivated fields, residences, and structures.

Atlantic would use the conventional subsurface bore method to cross the majority of national and state scenic byways, which would reduce impacts on the surface of the roadbed. The boring equipment, tree clearing for ATWS, and construction personnel may result in short- to long-term impacts on the viewshed for those traveling along the byways. To further reduce visual impacts associated with tree clearing, Atlantic would implement offsets for ATWS at the U.S. Highway 119/33 Staunton-Parkersburg Turnpike National Scenic Byway crossing at AP-1 mainline MP 114.8. Visual impacts would be minimal, localized, and intermittent, lasting only for the time it takes a traveler to cross the byway and for construction to occur (typically a few weeks at any given location). All disturbed areas would be restored to original conditions according to Atlantic's and DETI's *Restoration and Rehabilitation Plan*.

Beech Grove Road (Virginia Secondary Road 664), part of the Nelson Scenic Loop, would be crossed by the AP-2 mainline at MP 158.6. Both sides of the roadway crossing are forested and would be crossed using the HDD method. The second crossing at MP 15.9 would be crossed using the bore method. Potential visual impacts would occur at this crossing due to required tree clearing on the north side of the crossing at the bore entry point. However, both ATWS would be set back from the roadway to minimize impacts on passersby. As such, visual impacts at Beech Grove Road would not be significant and only occur for duration for those traveling on the roadway and for construction to occur (typically a few weeks at any given location).

We received comments regarding potential impacts near the Nelson Scenic Loop, designated by the Rockfish Valley Foundation in Nelson County, Virginia. The loop is a 50-mile-long scenic route that circles the Blue Ridge Mountains and Rockfish Valley, and includes the following scenic routes: Route 151, Route 664 (Beech Grove Road), the BRP, and Route 56. The loop is characterized by its cultural and agricultural landscapes and views of the Rockfish Valley and Blue Ridge mountains. The AP-1 mainline would cross the eastern portion of Nelson Scenic Loop.

Atlantic would determine the need to implement additional visual mitigation measures for scenic byways on a site-specific basis, depending on the assessment of the particular feature and the expected level of permanent visual impact that may result from tree removal for construction and operation of the pipeline facilities. All roadway crossings would be restored to original conditions to the extent practicable and disturbed areas would be revegetated according to Atlantic's *Restoration and Rehabilitation Plan*. Atlantic would consult with state and local agencies regarding the appropriate mitigation measures to be implemented at roadway crossings. Because this information is pending and additional measures have not yet been identified, as necessary, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, site-specific visual mitigation measures for each scenic byway developed in consultation with the DOT, FHA, WVDOT, VDOT, VDCR, and NCDOT. Atlantic should also provide documentation of agency consultation.**

We received comments regarding impacts on the viewshed near Little Mountain (AP-1 MP 92.5) as seen from Little Mountain Valley to the east and Jackson River Valley to the west. The pipeline would be installed along the ridgeline of Little Mountain and require tree removal and grading. Based on the existing tree line, the cleared right-of-way located on top of the ridgeline would be visible from surrounding viewpoints higher in elevation than Little Mountain, which is about 3,200 feet high. Relative to the Little Mountain Valley and the Jackson River Valley, which are at elevations lower than the Little Mountain ridgeline, the pipeline right-of-way would be visible from residences as a result of construction up the west side and down the east side of Little Mountain. Impacts on visual resources would be the same as those described for pipeline facilities in forested areas.

We received comments regarding the southern portion of the Rockfish Valley along Spruce Creek Park, which is crossed at AP-1 MP 163.3. The location of the crossing is within the South Rockfish Valley Rural Historic District, which consists of agricultural fields, scattered farm structures, residences, and existing roadways. Additional landscape views include patches of trees and views of the Rockfish River, Wintergreen Country Store, Elk Hill Farm complex, and Reid's Creek. We also received comments regarding impacts on overlooks and trails as a result of the project in the Wintergreen Resort area. This includes the Three Ridges Overlook, Blackrock Park on Blackrock Circle, Plunge Overlook on Blackrock Circle, Blue Ridge Overlook on Devils Knob Loop, Fortune's Ridge Trail, Pond Hollow Trail, Devil's Knob Trail, Laurel Ridge Loop, Brimstone Trail, trail to the Plunge Overlook, and Blackrock Trail. Atlantic would use conventional construction while crossing the Rockfish Valley, Spruce Creek Park, and the Wintergreen Resort area. Impacts on visual resources would be the same as those described for pipeline facilities in non-forested and forested areas, as described above.

We also received comments regarding the AP-1 mainline crossing of Route 250 (Hankey Mountain Highway), which is located east of the proposed Shenandoah National Scenic Area in the Deerfield Valley. The right-of-way crossing location near the Shenandoah National Scenic Area is located on private land about 0.7 mile northwest of the AP-1 mainline near MP 115. Atlantic initially considered establishing a KOP at the highest point of the scenic area; however, it was determined that a band of dense trees located along the northwest side of Route 250 and existing topography would block views from Shenandoah National Scenic Area. As such, and based on further reviews and discussions with the GWNF, it was determined that views of the pipeline corridor would be unlikely due to existing topography and trees.

We received comments on the draft EIS stating that ACP would impact the scenic beauty seen from trails on Crawford Mountain, Elliot Knob, and southern Shenandoah Mountain. Impacts on visual resources would be the same as those described for pipeline facilities in non-forested and forested areas, as described above.

We received comments on the draft EIS from the owners of the Fenton Inn in Nelson County, Virginia (approximate AP-1 MP 158.7) expressing concern about light pollution resulting from the HDD activities proposed nearby at the BRP and ANST crossings, which, as stated in section 4.11.2.2, could take 12 to 14 months to complete. Workspace areas associated with the HDD would be located about 300 feet southeast of the Fenton Inn's Bavarian Village. Depending on how the HDD equipment is placed, lighting required to support the continuous (24 hours a day/7 days a week) HDD installation may be visible to guests of the Fenton Inn. We agree with the commenter that mitigation for the light pollution is necessary given the proximity to the relatively isolated inn and the extended timeframe in which construction would occur in this area. Therefore, **we recommend that:**

- **As part of its Implementation Plan (recommended Environmental Condition No. 6), Atlantic should identify mitigation measures, for review and written approval by the Director of OEP, to reduce the impacts on the Fenton Inn at approximately ACP-1 MP 158.7 resulting from lighting equipment needed to support the HDD of the BRP and ANST.**

4.8.8.3 Aboveground and Ancillary Facilities

ACP and SHP would involve installation of or modifications to compressor stations, M&R stations, valves, pig launchers, pig receivers, cathodic protection systems (ground beds), and communication towers.

Descriptions of each aboveground facility are provided in section 2.1. Visual impacts associated with each facility type are provided below.

Compressor Stations

Construction and operation of the new ACP compressor stations would result in similar impacts on visual resources. Visual impacts from compressor stations typically result from the structures association with the stations (auxiliary, office, utility gas, drum storage, storage building, access roads, and fencing), and the removal of vegetation during construction.

The Compressor Station 1 footprint would be primarily located within agricultural and forested areas. Views of the compressor station from the few nearby residents would be limited due to existing forested areas with tall trees, and distance from the residences to the compressor station. Tree clearing would be required during construction however; Atlantic and DETI would maintain a buffer where possible, of screening trees around the compressor station sites. Views may be possible to those traveling on Hollick Run Road, which borders the southeast side of the compressor station, but these impacts would be short term and limited to the duration of those traveling on nearby roads.

The Compressor Station 2 is in a more populated area of Buckingham County that may be visible to more residents. However, the compressor station is located near previously developed residential and commercial areas and is consistent with the existing visual conditions in the area.

Compressor Station 3 would be in a rural area surrounded by scattered patches of forest and lawns. The landscape contrast of these vertical structures with the existing landscape may result in long term impacts on visual resources in these areas. However, long-term impacts would only occur for those residents living adjacent to or near the stations. All other visual impacts would be minor and short term and limited to the duration of those traveling on nearby roads.

Following construction, the temporary workspace required for construction at each compressor station would be restored according to Atlantic's *Restoration and Rehabilitation Plan*.

Modifications at SHP compressor stations would occur within the footprint of each existing facility; therefore, we do not anticipate a significant change in visual characteristics at these locations.

M&R Stations

One M&R station is proposed for SHP and nine M&R stations are proposed for ACP. Most M&R stations would be constructed within or adjacent to compressor station facilities, in areas of existing industrial development, or adjacent to the proposed pipeline in relatively rural locations. Therefore, we do not believe that M&R stations would significantly impact visual conditions.

Pig Launchers and Receivers and Valves

Pig launchers and receivers would generally be located within the footprint of the compressor stations or M&R stations. These structures are smaller and less visible than the other aboveground facilities and would have insignificant visual impact.

Only a small portion of valve equipment would extend above the ground. However, these areas would be fenced and gated. Therefore, the valves may have visual impacts when located near roads and houses, without landscape or vegetation screening. Valves located near roadways may be visible to motorists. However, given their small size, it is unlikely that impacts on motorists' view would be significant.

Communication Towers

A total of 26 communication towers would be required to facilitate communications during operation of ACP (see table 2.1.2-6). Atlantic would lease space or install new antennas on up to 11 existing communication tower sites. Fifteen new communication towers would be installed within or adjacent to compressor stations, M&R sites, and valve sites proposed for ACP. New towers would range between 80 and 395 feet high. The actual tower height would depend on several factors including the wireless systems the tower supports, the wireless coverage and line of sight between tower sites, and the landscape and tree height surrounding each tower site. A communications shelter at each site would consist of an approximately 10- by 15-foot, single story building with a concrete foundation. Due to their vertical structure, towers would create a visual contrast across the landscape, particularly in open lands where the facilities would be visible for further distances. However, most of the new towers would be located near developed areas with landscapes that have been previously disturbed. New towers in these areas would be consistent with the already disturbed existing views and would not result in significant visual impacts.

Contractor Yards

Atlantic and DETI would require approximately 35 contractor and/or pipe yards to store project equipment, vehicles, and machinery during project construction. Atlantic and DETI have located most of the proposed contractor yards in previously disturbed, developed, or open lands to reduce the extent of clearing and grading required for the sites. Atlantic would also, to the extent practical, avoid impacts on forested areas by not cutting trees during the grading process for the contractor yards. Most contractor and pipe storage yards are in agricultural areas and would not create strong visual contrasts across the landscape. A summary of land use types affected by contractor yards are provided in table 4.8.1-1. Contractor yards may initially create minor visual impacts in localized areas from clearing, grading, and filling but all disturbed work areas would be stabilized and revegetated as soon as possible after final grading in accordance with the construction and restoration plans or as requested by the landowner or land management agency. This would eliminate visual impacts as vegetation becomes established.

Access Roads

Atlantic and DETI propose to construct temporary and permanent access roads to access project workspaces. Construction of temporary access roads would result in similar impacts on visual resources as those described for pipeline facilities. Atlantic and DETI would limit the removal of trees and vegetation to only those required to safely travel along the roads. When construction of the right-of-way is complete, all temporary roads would be restored to original contours and disturbed areas would be reseeded according to Atlantic's and DETI's *Rehabilitation and Restoration Plan*. Visual impacts from access roads would be temporary and insignificant. Permanent access roads in forested areas associated with operation of the project would represent a permanent visual impact. Visual impacts would be similar to those described in section 4.8.8.2 for pipeline facilities in forested areas.

4.8.9 Federal Lands

This section addresses land use, recreation, and visual resources on federal lands, including a detailed analysis of proposed and potential land management plan amendments for the MNF and GWNF. As listed in table 4.8.9-1, the AP-1 mainline would cross 21.2 miles of NFS lands as well as 0.1 mile of NPS-owned land associated with the BRP. SHP would not affect any federal lands; therefore, SHP is not discussed in the following sections. In addition, while not crossed, ACP would be within 0.25 mile of the FWS Great Dismal Swamp NWR, which is discussed in section 4.8.9.3.

4.8.9.1 Forest Service

Land Use and Ownership

Management of the NFS is one important component of the mission of the FS, an agency of the USDA. The FS manages 154 National Forests and 20 National Grasslands for grazing, timber, mining, recreation, wildlife habitat, wilderness, and other uses (FS, 2016f). NFS lands comprise about 99 percent of the total federal lands affected by the project. As listed in table 4.8.9-1, the pipeline would cross 5.2 miles of the MNF in Pocahontas County, West Virginia, which is managed by the Marlinton-White Sulphur Ranger District, at various locations between AP-1 MPs 73.1 and 83.9. Although not crossed by the pipeline, the project's temporary workspace, ATWS, and an access road would affect NFS lands on the MNF between about MPs 71.6 and 72.0. The pipeline would cross 16.0 miles of the GWNF in Highland, Bath, and Augusta Counties, Virginia, which is managed by the Warm Springs, North River, and the Glenwood-Pedlar Ranger Districts, at various locations between AP-1 MPs 83.9 and 158.2. This includes a proposed crossing of the ANST on NFS lands.

Table 4.8.9-2 lists the acres affected by construction and operation of ACP by land use type on NFS land. This includes land associated with the pipeline right-of-way, ATWS, access roads, and a contractor yard. Each land use type is defined in section 4.8.1. No aboveground facilities associated with ACP would be sited on NFS lands.

In addition to the pipeline facilities, roads to access the pipeline right-of-way during construction and operation would be located on NFS lands (see table 4.8.9-3). Also, there would be minor appurtenances that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by the DOT's PHMSA code, and have negligible land use impacts.

In comments on the draft EIS, the FS recommended that Atlantic provide further justification for proposed access road 36-016.AR1 at AP-1 MP 96.3 due to concerns about its use from the GWNF. The proposed access road would follow FR 281 where it consists of a two-track primitive road along the southern boundary of Rx 4D-Browns Pond Special Biological Area. In response to the FS' recommendation, Atlantic stated that it would widen the entrance-way where FR 281 intersects Indian Draft Road, and apply gravel to the road surface. Atlantic contends that it is not proposing construction or reconstruction of FR 281. However, as described in more detail in section 4.4.7, there are discrepancies regarding potential improvements needed to accommodate construction equipment on FS 281 and where they may occur along proposed access road 36-016.AR1. As such we have recommended in section 4.4.7 that Atlantic provide additional information reading proposed access road 36-016.AR1 prior to construction.

In its comments on the draft EIS, the FS recommended that Atlantic remove proposed access road 36-014.AR3 at AP-1 MP 94.1 from the project and provide a revised draft *COM Plan* that reflects this removal. In response to our recommendation, in its January 27, 2017 supplemental filing, Atlantic revised its draft *COM Plan* (see appendix G) such that proposed access road 36-014.AR3 at AP-1 MP 94.1 is no longer proposed for use during the project.

TABLE 4.8.9-1

Federal Lands Crossed by the Atlantic Coast Pipeline [a]

Jurisdiction/Name/County, State or Commonwealth	Begin Milepost	End Milepost	Miles Crossed [b]
U.S. DEPARTMENT OF AGRICULTURE – FOREST SERVICE			
Monongahela National Forest [c]			
Pocahontas, WV	73.1	73.6	0.8
Pocahontas, WV	80.5	80.7	0.3
Pocahontas, WV	80.7	80.9	0.2
Pocahontas, WV	81.2	83.9	3.9
Subtotal			5.2
George Washington National Forest			
Highland, VA	83.9	86.9	4.1
Bath, VA	93.7	94.3	0.8
Bath, VA	96.1	96.3	0.4
Bath, VA	96.5	96.6	0.2
Bath, VA	96.8	97.2	0.7
Bath, VA	98.3	99.0	1.3
Bath, VA	99.3	99.6	0.5
Bath, VA	105.9	106.1	0.2
Augusta, VA	113.0	113.1	0.1
Augusta, VA	113.2	113.2	<0.1
Augusta, VA	115.7	116.1	0.4
Augusta, VA	116.3	116.4	0.1
Augusta, VA	116.6	120.5	3.8
Augusta, VA	120.9	123.2	2.1
Augusta, VA	154.0	155.2	1.2
Augusta, VA	158.0 [d]	158.2	0.1
Subtotal			16.0
U.S. DEPARTMENT OF INTERIOR, NATIONAL PARK SERVICE			
BRP			
Augusta/Nelson, VA	158.2	158.3	0.1
Project Total			21.3

[a] Features crossed are along the AP-1 mainline.

[b] Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost. However, the project total miles crossed represent the actual distance.

[c] Although not crossed by the pipeline, the project's proposed temporary workspace, ATWS, and an access road would affect the MNF between about MPs 71.6 and 72.0. Table 4.8.9-2 includes the impacts associated with these areas.

[d] Includes ANST corridor.

Source: FS, 2011; FS, 2014

TABLE 4.8.9-2

Summary of Land Use Types Affected by Construction and Operation of the Atlantic Coast Pipeline on National Forest System Lands (in acres)

	Agriculture – Crops and Pasture		Agriculture – Tree Plantation/Harvest Forest		Forest		Developed		Open		Wetland		Open Water		Total	
Feature/Facility	Con.[a]	Op.[a]	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Monongahela National Forest																
AP-1 Mainline Right-of-Way	0.0	0.0	0.0	0.0	74.9	29.7	2.6	1.0	0.2	0.1	<0.1	<0.1	0.1	<0.1	77.9	30.9
ATWS [c]	0.0	0.0	0.0	0.0	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.0
Access Roads	0.0	0.0	0.0	0.0	17.4	17.4	7.4	7.4	0.0	0.0	0.1	0.1	0.1	0.1	25.0	24.9
Yards	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
MNF Subtotal	0.0	0.0	0.0	0.0	101.7	47.1	10.0	8.4	0.2	0.1	0.1	0.1	0.2	0.1	112.3	55.8
George Washington National Forest																
AP-1 Mainline Right-of-Way	<0.1	<0.1	5.8	2.8	220.7	88.8	5.6	2.1	1.8	0.8	0.2	0.1	0.8	0.3	235.0	94.7
ATWS [c]	0.0	0.0	0.3	0.0	15.2	0.0	0.2	0.0	0.6	0.0	0.0	0.0	<0.1	0.0	16.4	0.0
Access Roads	0.0	0.0	1.4	1.4	22.1	21.4	32.5	32.4	8.3	8.3	<0.1	<0.1	2.4	2.4	66.8	63.6
GWNF Subtotal	<0.1	<0.1	7.5	4.2	258.0	110.2	38.3	34.5	10.7	9.1	0.3	0.2	2.4	2.7	318.1	158.2

[a] Project-specific construction right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on typical construction right-of-way widths (125, 110, 75, 50, etc.) for the entire length of the pipeline discussed in section 2.2.1. The construction right-of-way would be reduced at certain locations (e.g., wetlands), some portions of the right-of-way would overlap with existing rights-of-way that have been previously disturbed, and/or the HDD method would be used to avoid direct impacts on land use.

[b] Project-specific operational right-of-way widths are discussed in the project-specific sections below. Note that impacts presented are based on a typical operational right-of-way width of 50 feet for the entire length of the pipeline discussed in section 2.2.1. Most land use types would be allowed to revert to preconstruction conditions, limited vegetation maintenance would be allowed in wetlands, some portions of the right-of-way would overlap with existing rights-of-way that are maintained, and/or the HDD method would be used to avoid direct impacts on land use.

[c] Includes additional temporary workspace, topsoil segregation areas, and water impoundment structure locations.

Note: Due to rounding, some addends may be off by 0.1 place.

TABLE 4.8.9-3

National Forest System Roads Proposed as Access Roads for the Atlantic Coast Pipeline [a, b]

ACP Access Road Number	Pipeline Milepost	NFS Name/Identification Number	Approx. Length (miles)	Long-term/ Temporary
Monongahela National Forest				
05-001-C009.AR1	71.7	Buzzard Ridge/FR 1026 and N/A (includes new road to connect Buzzard Ridge/FR 1026 to pipeline)	4.7	Long-term
05-001-E064.AR1	81.8	Sugar Camp Road/FR Road 1012 and N/A (includes new road to connect Sugar Camp/FR 1012 to pipeline)	1.7	Long-term
05-001-E064.AR2	83.3	Allegheny/FR 55	1.5	Long-term
05-001-E064.AR3	83.3	Upper Shock Run/FR 1017	<0.1	Long-term
George Washington National Forest				
06-001-B001.AR3	85.0	New road to Mill Cap Road/FR 84	0.2	Long-term
06-001-B001-AR7	85.3	N/A (new road)	0.5	Long-term
06-001-B001.AR4	85.4	N/A (new road)	0.4	Long-term
06-001-B001.AR5	86.4	N/A (new road)	1.1	Long-term
36-014.AR2	93.7	FR 124	5.5	Long-term
36-016.AR1	96.3	FR 281	2.8	Long-term
36-016.AR2	99.5	FR 309	0.6	Long-term
07-001.AR1-AR3	117.2	FR 449A	2.6	Long-term
07-001.AR1-AR4	117.3	N/A (new road)	<0.1	Long-term
07-001.AR1-AR6	118.0	N/A (new road)	0.3	Long-term
07-001.AR1-AR8	120.2	FR 466A	0.3	Temporary
07-001.AR1-AR9	120.4	FR 466	0.6	Long-term
07-001.AR1-AR7	121.2	FR 1755	0.4	Long-term

[a] Does not include roads that have been assigned a FS name or number but are located on private lands. Features crossed are along the AP-1 mainline.

[b] Access roads are based on a review of Atlantic's draft *COM Plan* and GIS shapefiles provided by Atlantic and the FS.

In addition, activities proposed at two existing communication towers are on NFS lands: the Bath County Power Station in Bath County, Virginia and the Rocky Mountain MW Site in Rockbridge County, Virginia (see table 2.1.2-6). Dominion currently owns both towers and proposes to install new antennas at each site as part of ACP. The FS determined that no additional authorizations are required from the NFS to conduct these activities because they would occur at previously authorized sites and not require additional land disturbance. Therefore, they are not discussed further in this section.

Temporary impacts of the pipeline on federal lands would include timber and brush clearing, grading, trenching, impacts on visual quality at some locations, and soil compaction as a result of equipment driving and storage of logs, slash, pipe lengths, and other supplies. Long-term impacts include the time it would take trees to grow back within the temporary construction right-of-way and trees and shrubs within the portion of the long-term right-of-way that would not be converted to herbaceous groundcover. Following construction, land uses would be allowed to revert to preconstruction conditions, except for the portion of the long-term right-of-way that would be revegetated with grasses, pollinator species, shrubs, and shallow-rooted trees.

Atlantic developed a draft *COM Plan* that describes the construction, restoration, and operation measures Atlantic would implement for ACP on federal lands to avoid and minimize impacts from pipeline construction and operation. The MNF and GWNF reviewed the second draft of the *COM Plan* and filed comments with the FERC on April 6, 2017.[17] The *COM Plan* continues to be revised. The current draft of the *COM Plan* is included as appendix G.

If approved, Atlantic would acquire a 50-foot-wide long-term right-of-way on federal lands. To minimize forest fragmentation and impacts on scenery, the FS would require that operational and maintenance provisions outlined within the FERC *Procedures* be applied to upland areas along the area of the right-of-way such that the permanently maintained right-of-way would be no greater than 30 feet wide. Atlantic would reduce its mowing to a 10-foot-wide strip centered over the pipeline, and also reduce its trimming or selective cutting of trees to a 30-foot-wide strip centered over the pipeline. These routine maintenance standards would not occur between the entry and exit points where an HDD crossing is adopted, such as the ANST crossing.

Atlantic is currently identifying areas of ecologically sensitive areas crossed by the proposed AP-1 mainline within the MNF and GWNF where the construction right-of-way can be narrowed from 125 feet to 75 feet. Atlantic contends that the 125-foot-wide construction right-of-way is required to safely construct pipeline based on the pipe diameter, the excavation depth, and equipment size needed to handle the pipe. Based on previous project experience, project area terrain, and industry guidance (INGAA, 2013), we agree. However, there may be short distances where reducing the construction right-of-way to 75 feet is possible, provided favorable topographic conditions exist. ATWS would still be needed on each side of the right-of-way to stage spoil and equipment. Atlantic is working with the MNF and GWNF to identify locations where a narrowed right-of-way may be adopted and where corresponding ATWS on each side of the narrowed section would be located.

In addition, an additional 25 feet of ATWS would be required on FS lands to accommodate the topsoil created by full topsoil stripping. In response to our recommendation in the draft EIS, Atlantic identified seven locations (five on the MNF and three on the GWNF) where ATWS is needed for this activity. The impacts identified in tables 4.8.1-1 and 4.8.9-2 include these areas.

In its updates on the project after issuance of the draft EIS, Atlantic noted that it is continuing to work with the MNF and GWNF to reduce construction workspace. Because information regarding a reduced construction right-of-way has not yet been provided, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary the locations where it will adopt a narrowed right-of-way to reduce impacts on forest land and ecologically sensitive areas within the MNF and GWNF, along with the locations of corresponding ATWS**.

Forest lands from which wood products can be produced are typically managed as merchantable timber on NFS lands (FS, 2011; 2014). (In contrast, non-merchantable timber cannot be sold to produce wood products due to poor form, rot, or other defect.) Merchantable timber is managed on both the MNF and GWNF. During forest land and resource management planning, the FS is required to identify lands unsuited for timber production (16 U.S.C. 1604[k]; 36 CFR 219.14).[18] Timber production is defined as "the purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into

[17] FERC eLibrary Accession Number 20170406-5440.

[18] The following documents direct timber management on NFS land: FSM 2400 - Timber Management; Forest Service Handbooks: 2409.13 - Timber Resource Planning Handbook, 2409.13a - Timber Permanent Plot Handbook, 2409.15 - Timber Sale Administration Handbook, 2409.17 - Silvicultural Practices Handbook, 2509.18 - Soil Management Handbook, 2609.13 - Wildlife and Fisheries Program Management Handbook, and 2509.22 – Soil and Water Conservation Practices Handbook; and Timber Sale Contract Provisions and procurement contracts.

logs, bolts, or other round sections for industrial or consumer use. For purposes of forest planning, timber production does not include the production of fuelwood or harvests from unsuitable lands" (36 CFR 219.3, 1982 rule). Section 4.8.1.1, Timber Removal, provides an overview of Atlantic's proposed timber removal activities. In addition, the following provides additional information regarding timber removal on federal lands affected by ACP.

Suitable timber production lands comprise about 70 to 80 percent of the total ACP crossing length of the MNF and GWNF. Table 4.8.9-4 lists the estimated crossing lengths for late seral (i.e., mature forest at climax stage), mid-seral (i.e., younger forest in transition), and recently harvested forest lands on NFS lands. Because a timber cruise has not yet been conducted, Atlantic identified recently harvested forest (i.e., within the last few years) as mature forests that have been selectively logged, and areas that have been heavily cleared or clear cut with no or little regrowth apparent or that had been replanted with seedlings or supporting up to knee-high saplings. Mid-seral stands were identified as generally ranging from thinner to full stands without evidence of logging roads and areas with noticeably shorter and younger trees. Most of federal lands crossed are composed of late seral forest, which consists of mature mixed deciduous and mixed coniferous trees.

TABLE 4.8.9-4

Recently Harvested, Early/Mid Seral, and Late Seral Forests Crossed by the Atlantic Coast Pipeline on National Forest System Lands (miles)

National Forest	Recently Harvested Forest Crossed (miles)	Early/Mid-Seral Crossed (miles)	Late Seral Crossed (miles)
Monongahela National Forest	0.0	0.0	5.1
George Washington National Forest	0.0	0.7	15.2
Project Total	0.0	0.7	20.3

In determining impacts based on tree size, Atlantic considered large trees to be anything over roughly 50 feet in height with a mature spreading crown; medium trees were younger trees generally found in previously cut-over areas exhibiting even-age growth patterns and in plantation plantings specifically planted by or for forest products companies; and small trees were those located in fields or tree plantations that varied in height from small to large saplings. Table 4.8.9-5 lists the tree types that occur along ACP on NFS lands.

TABLE 4.8.9-5

Impacts on National Forest System Lands by Tree Size Associated with the Atlantic Coast Pipeline (acres)

	Small Trees (acres)		Medium Trees (acres)		Large Trees (acres)	
National Forest	Within Temporary Workspace	Within Long-term Right-of-Way	Within Temporary Workspace	Within Long-term Right-of-Way	Within Temporary Workspace	Within Long-term Right-of-Way
Monongahela National Forest	0.0	0.0	0.0	0.0	78.0	33.4
George Washington National Forest	3.5	1.5	7.1	3.0	231.3	99.0
Project Total	3.5	1.5	7.1	3.0	309.3	132.4

A portion of the small to medium trees would not be merchantable (e.g., those less than 25 years in age). Future timber production would be lost on these young stands. The exact number and board feet of these non-merchantable trees would be determined during timber cruises. In the long-term, operation of the pipeline would permanently affect about 47 acres of forest on the MNF and 125 acres of forest on the GWNF (see table 4.8.9-2), so this amount would be removed from the future timber base. This impact would be because trees would not be allowed to grow within the maintained easement within 15 feet of the centerline. This would include about 132 acres of large trees. However, not all this land is considered suitable for timber production. The amount of land that would be removed and is suitable for timber production. About 66 acres would be permanently removed from the lands identified as suitable for timber production on the GWNF as a result of operation of the ACP. About 31 acres would be permanently removed from the lands identified as potentially suitable for timber production on the MNF as a result of operation of the ACP.

ACP would cross and be located within 0.25 mile of known planned timber sales on the GWNF at AP-1 MPs 122.7 to 122.8. One timber sale, referred to as the White Way Sale, would be crossed by ACP and has a sale contract expiration date of November 2017. A second timber sale, referred to as the Jennings Grouse Sale, is scheduled for some time in 2017 and would be north of the White Way Sale, and thus not directly affected by construction and operation of ACP.

On NFS lands, timber would be cruised, marked, and appraised to FS standards. Atlantic would pay for the timber land affected by the project and cut and remove the merchantable timber per utilization standards described in the timber sale contract. The FS would prepare a *Timber Cruise Plan* to be followed by Atlantic and a qualified timber cruise contractor under contract to and at the direction of Atlantic. Atlantic and the FS are also currently coordinating the development of a *Timber Extraction Plan* specific to the MNF and GWNF. As discussed in section 4.8.1.1, the *Timber Extraction Plan* would discuss the results of a timber cruise.

We received comments on the draft EIS from the FS noting that the following additional requirements would apply to timber removal activities on NFS lands:

- Timber harvesting on steep slopes (40 percent or greater) would need to be done in a manner that ensures slope stability and complies with MNF LRMP standard SW07 from the time the timber is harvested until pipeline construction begins.

- Winter logging must meet MNF LRMP SW09 as well as all other erosion control plans and FS LRMP standards.

- Options include helicopter logging, use of overland equipment that does not require skid road development, and other non-ground disturbing methods as approved by FS personnel.

- Sediment and erosion control features are to be employed on these slopes as outlined in the *COM Plan*. Short-term erosion control measures are to be used as directed in the *COM Plan* prior to the start of disturbance for the construction of the pipeline replacement.

- All timber harvest roads are to be fully reclaimed and restored according to MNF LRMP standards (RF07, RF12, RF13, and RF15).

In addition, the following forestwide standards from the GWNF LRMP are to be applied where applicable:

- FW-185: Apply leave tree and unit markings so as not to be visible within 100 feet of Concern Level 1 and 2 travelways and use areas. [19]

[19] The USDA Agriculture Handbook Number 701, “Landscape Aesthetics: A Handbook for Scenery Management” provides the criteria for concern level 1 and 2 travelways and use areas. This criterion was used to prepare the inventory for the GWNF 1993 Forest LRMP; however, a list of these travelways is not available. The concern levels can be interpolated using the GIS inventory. To meet the mitigations specific to concern level 1 and 2 travelways, coordination with the FS to perform this interpolation would be required.

- FY-186: Remove, burn, chip or lop slash when visible within a 100-foot zone of Concern Level 1 and 2 travelways and use areas. These treatments result in an average slash height of 2 feet of the ground.

- FY-187: Design and construct roads to blend with the desired landscape character in form, line, color, and texture.

- FW-188: During temporary or permanent road construction, eliminate or remove from view, slash and root wads as viewed from the immediate foreground of High and Moderate SIO viewing platforms to the extent possible.

    - To the extent consistent with the *COM Plan*, some slash may be utilized for sediment and erosion control features.

- FY-189: Remove or place out of sight root wads and other unnecessary debris within 150 feet of KOPs on Concern Level 1 and 2 travelways and use areas.

- FY-190: Locate log landings and skid trails out of view to avoid bare mineral soil observation from Concern Level 1 travel routes and viewing platforms.

Timber sale boundary designation, volume estimation, appraisal, and contract preparation would be accomplished as negotiated between Atlantic and the federal land managers. The FS would establish a value for reproduction timber destroyed by ACP. Tree removal associated with the project would be handled as a settlement or tree measure sale, with value being determined by the results of the timber cruise; payment must be received and cleared before any cutting. The authority and procedure the FS would use to dispose of merchantable timber cut for construction of the pipeline are addressed under 36 CFR 223.12: Permission to cut, damage, or destroy trees without advertisement. This regulation authorizes the FS, under the issuance of a right-of-way or special use authorization, to sell the timber directly to Atlantic at the current appraised value. Atlantic would be the contractor for harvesting activities on federal lands, although logging would likely be done by subcontractor. Atlantic intends to negotiate one contract with the FS covering both National Forests crossed by the pipeline route.

In addition to the *Timber Removal Plan* discussed in section 4.8.1.1, timber removal on the NFS lands would also be addressed in ACP's draft *COM Plan*. The draft *COM Plan* would identify additional and/or site-specific requirements for tree removal and restoration of forested lands. In addition, to avoid potential adverse impacts on wildlife and wildlife habitat, the FS has recommended no burning on NFS lands. Large woody debris from cleared vegetation and stumps would be placed along the edge of the right-of-way to minimize the potential for soil erosion and sedimentation. The material would be placed in a manner that would not impede natural drainage, and gaps would be left at intervals to provide passage for wildlife and human uses on NFS land. If any cleared vegetation must be chipped on-site, Atlantic would haul chips off the right-of-way to a disposal site off NFS land. Atlantic will work with the FS to finalize the *COM Plan* with this requirement.

The MNF and GWNF expressed concerns regarding the potential for ACP to change or reduce the FS' ability to use prescribed fires and conduct other timber management activities. Specific concerns include the following:

- the pipeline right-of-way and a buffer zone adjacent to the right-of-way could be prohibited for use as a firebreak for prescribed fire activities.

- access across the pipeline right-of-way during prescribed burns could be limited.

- the project may affect firefighting capabilities in the event of wildfires.
- timbered areas adjacent to the pipeline right-of-way may be subject to certain harvesting restrictions for pipeline integrity purposes.

Forest operations, including timber production and harvesting, hauling timber, logging road construction and maintenance, application of chemicals, and disposal of slash on forest lands adjacent to the permanent pipeline easement are not expected to be significantly altered, nor would the costs of forestry operations be expected to increase due to the presence of the pipeline. Atlantic would not prohibit prescribed fire, timber management, and wildfire management activities undertaken on NFS lands during project operation, with a few exceptions. The FS would be restricted from conducting grading or excavation on the right-of-way associated with fire or timber management activities unless planned with and supervised by Atlantic pipeline operations personnel. Also, road or skid trail construction on the pipeline right-of-way would need to be coordinated with Atlantic's pipeline operations personnel to ensure compatibility with pipeline integrity standards. For example, it may be necessary to provide additional cover directly over the pipeline in equipment crossing areas and on logging roads. Fire or timber management activities not directly affecting the pipeline right-of-way would not be restricted, unless the activity were to indirectly cause or contribute to undermining or erosion of the right-of-way. While the requirement to coordinate with the pipeline operator could be an inconvenience for some forest operators, including the FS, it does not constitute a significant change in forestry operations because the operator would be able to continue to cross the pipeline area to access or haul timber. Additionally, timber managers generally develop and carefully consider future harvesting and access plans.

The FS also identified concerns associated with leaving woody material on the pipeline right-of-way and potential increased wildfires from fuel loadings. Atlantic is currently coordinating with the MNF and GWNF to identify possible uses of excess woody material. Examples include using the material for wildlife habitat, blocking unauthorized OHV use, reducing visual impacts, and erosion control/restoration purposes. Table 18.3-1 of ACP's draft *COM Plan* would identify potential OHV blocking locations (see appendix G).

Atlantic would continue to consult directly with the MNF and GWNF regarding coordinating timber sales, timber valuation/compensation, and timber management activities.

In summary, construction would result in short- to long-term impacts on forest land, and operation of the project would result in the permanent loss of timber within the maintained, operational right-of-way and along new long-term access roads. Trees to be harvested on NFS land would be purchased by Atlantic and would be used during restoration, disposed of, or recycled. Cleared trees may also be sold for timber subject to landowner easement negotiations. Atlantic would coordinate with landowners and land-managing agencies to determine fair compensation for removed merchantable timber.

Additional information regarding specific tree and other vegetative species (e.g., oak ecosystems, pines) affected by the project and Atlantic's mitigation measures is included in sections 4.4.3 through 4.4.10.

Forest Service Land and Resource Management Plans

National forests are managed under individual LRMPs as required by the Forest and Rangeland Renewable Resources Planning Act of 1974, amended by the NFMA and incorporated into the agency planning regulations (36 CFR 219, [2012 version]). LRMPs are unique to a national forest and provide strategic, integrated resource direction for guiding project and activity decision-making on that national forest. Consistent with the Multiple-Use Sustained-Yield Act of 1960, the FS manages NFS lands to sustain the multiple use of its renewable resources in perpetuity while maintaining the long-term health and productivity of the land. LRMPs guide management of NFS lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future. LRMPs do not authorize projects or activities or commit the FS to take action. LRMPs may constrain the agency from authorizing or carrying out projects and activities, or the manner in which they may occur. All projects and activities occurring on NFS lands must be consistent with the respective LRMP for those lands (§ 219.15). LRMPs are strategic documents that describe the desired conditions, land use allocations, suitable management practices, objectives, standards, and monitoring and evaluation requirements for a forest over the next 10 to 15 years. Land use allocations are Rx areas within a National Forest having common biological, physical, watershed, and social conditions. These LRMPs provide the following types of management direction that can apply forestwide or by Rx area (FS, 2011):

- Desired Conditions – Describe specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed.

- Goals – Statements that help describe desired conditions, or how to achieve those conditions. Goals are designed to maintain conditions if they are currently within their desired range, or move conditions toward their desired range if they are currently outside that range. Goals are normally expressed in general terms that are timeless, and there are no specific dates by which they must be achieved. Goal statements form the basis from which objectives are developed.

- Objectives – Concise, measurable, time-specific statements of actions or results designed to help achieve desired conditions. The timeframe for accomplishing objectives, unless otherwise stated, is generally considered to be the planning period (e.g., 10 to 15 years).

- Standards – A mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements. Forestwide Standards apply to the entire National Forest unless superseded by specific Rx area direction.

- Guidelines – A constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met.

- Suitable Uses/Suitability of Lands – Specific lands within a plan area would be identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The plan would also identify lands within the plan area as not suitable for uses that are not compatible with desired conditions for those lands.

The LRMP for the MNF was approved in 2006 and updated in 2011. The LRMP for the GWNF was approved in 2014. Each LRMP has different management direction that is specific to each national forest.

The pipeline would pass through portions of three Rx areas on the MNF and four Rx areas on the GWNF (see table 4.8.9-6). In addition, access roads proposed for use would be located within three Rx areas on the MNF and seven Rx areas on the GWNF (see table 4.8.9-7). Approximately 3 acres of ATWS would be located on the MNF in Rx 3.0 (1 acre), Rx 4.1 (less than 1 acre), and Rx 6.1 (1.4 acres). Approximately 10 acres of ATWS would be in Rx 13 and 3 acres in Rx 7E1 on the GWNF.

MNF Management Prescription 3.0 – Vegetation Diversity emphasis covers a diversity of landforms and ecosystems across the forest. These areas are managed to provide age class diversity and sustainable timber production; a variety of forest scenery; habitat for a variety of wildlife species; and a primarily motorized recreation environment. Pipeline (utility corridor) and road construction are not prohibited in this Rx area.

MNF Management Prescription 4.1 – Spruce and Spruce-Hardwood Ecosystem Management areas focus on restoration and management of disjunctive red spruce and spruce-hardwood communities of the central Appalachians. This community has been greatly reduced and altered from its former extent, composition, and structure, primarily due to exploitative management that occurred prior to the establishment of the MNF. The forest now contains most of the remaining acreage of central Appalachian spruce and spruce-hardwood forest, as well as most of the acreage upon which it formerly occurred. Therefore, the forest bears primary responsibility for the restoration and management of this unique community. These areas emphasize restoration of the spruce and spruce-hardwood communities, and the recovery of the threatened and endangered species and other species of concern associated with them.

MNF Management Prescription 6.1 – Wildlife Habitat Emphasis are areas where vegetation management is used to enhance a variety of wildlife habitat. These areas are managed to provide a sustainable production of mast and other plant species that benefit wildlife, restore pine-oak and oak-hickory communities, restrict motorized access and provide a network of security areas reduce disturbance to wildlife, provide a primarily non-motorized recreational setting, and provide a mix of forest products. Road construction and utility corridors are allowed in the Rx area with parameters.

TABLE 4.8.9-6

Monongahela and George Washington National Forests Management Prescriptions Crossed by the Atlantic Coast Pipeline

Management Prescription Area Name	Begin Milepost	End Milepost	Impacts (acres) [b]	
			Construction	Operation
Monongahela National Forest				
3.0 – Vegetation Diversity	73.1	73.6	12.0	4.6
6.1 – Wildlife Habitat Emphasis	80.5	80.7	4.2	1.7
6.1 – Wildlife Habitat Emphasis	80.7	80.9	3.3	1.3
6.1 – Wildlife Habitat Emphasis	81.2	83.9	67.4	29.7
Project Total			86.9	37.3
George Washington National Forest [c]				
13 – Mosaics of Wildlife Habitat	83.9	86.9	65.8	27.0
13 – Mosaics of Wildlife Habitat	93.7	94.3	12.2	4.5
13 – Mosaics of Wildlife Habitat	96.1	96.3	10.6	7.4
13 – Mosaics of Wildlife Habitat	96.5	96.6	2.4	1.1
13 – Mosaics of Wildlife Habitat	96.8	97.2	9.7	3.9
13 – Mosaics of Wildlife Habitat	98.3	99.0	19.9	8.0
13 – Mosaics of Wildlife Habitat	99.3	99.6	9.8	5.1
13 – Mosaics of Wildlife Habitat	105.9	106.1	2.7	1.3
13 – Mosaics of Wildlife Habitat	113.0	113.1	1.1	0.6
13 – Mosaics of Wildlife Habitat	113.2	113.2	0.1	0.1
13 – Mosaics of Wildlife Habitat	115.7	116.1	5.8	2.1
13 – Mosaics of Wildlife Habitat	116.3	116.4	1.0	0.4
13 – Mosaics of Wildlife Habitat	116.6	120.5	72.1	34.0
13 – Mosaics of Wildlife Habitat	120.9	123.2	35.8	14.2
7E1 – Dispersed Recreation Areas	154.0	155.2	24.0	6.9
4A – ANST	158.0 [d]	158.2	0.0 [d]	0.0 [d]
Project Total			273.0	116.6

[a] Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost.

[b] Features crossed are along the AP-1 mainline. Includes construction and operational pipeline right-of-way, ATWS, and yards. Rxs affected by proposed access roads are listed in table 4.8.9-7.

[c] Rx 11-Riparian Corridors occur within the other Rxs. Although these areas are not mapped, they are defined in the LRMP and have specific desired conditions and standards.

[d] Includes the ANST, which would be crossed using the HDD method, avoiding surface impacts.

Source: FS, 2011; 2014

TABLE 4.8.9-7

Monongahela and George Washington National Forests Management Prescriptions Affected by Proposed Access Roads for the Atlantic Coast Pipeline

ACP Access Road Number	Pipeline Milepost	NFS Name/Identification Number	Management Prescription [a]
Monongahela National Forest			
05-001-C009.AR1	71.7	Buzzard Ridge/FR 1026	4.1 – Spruce and Spruce-Hardwood Ecosystem Management
05-001-C009.AR1	71.7	New road (needed to connect FR 1026 to pipeline corridor)	3.0 – Vegetation Diversity
05-001-E064.AR1	81.8	New road and Sugar Camp Road/FS Road 1012	6.1 – Wildlife Habitat Emphasis
05-001-E064.AR2	83.3	Allegheny/FR 55	6.1 – Wildlife Habitat Emphasis
05-001-E064.AR3	83.3	Upper Shock Run/FR 1017	6.1 – Wildlife Habitat Emphasis
George Washington National Forest			
06-001-B001.AR3	85.0	New road to Mill Cap Road/FR 84	13 – Mosaics of Wildlife Habitat
06-001-B001.AR7	85.3	N/A (new road)	13 – Mosaics of Wildlife Habitat
06-001-B001.AR4	85.4	N/A (new road)	13 – Mosaics of Wildlife Habitat
06-001-B001.AR5	86.4	N/A (new road)	13 – Mosaics of Wildlife Habitat
36-014.AR2	93.7	FR 124	13 – Mosaics of Wildlife Habitat 5C – Utility Corridor 8E4b – Indiana Bat Secondary Cave Protection 7B – Scenic Corridors and Viewsheds
36-016.AR1	96.3	FR 281	13 – Mosaics of Wildlife Habitat 4D – Special Biological Area (Browns Pond) 2C3 – Eligible Recreation River Corridor
36-016.AR2	99.5	FR 309	13 – Mosaics of Wildlife Habitat
07-001.AR1-AR3	117.2	FFR 449A	13 – Mosaics of Wildlife Habitat
07-001.AR1-AR4	117.3	N/A (new road)	13 – Mosaics of Wildlife Habitat
07-001.AR1-AR6	118.0	N/A (new road)	13 – Mosaics of Wildlife Habitat
07-001.AR1-AR8	120.2	FR 466A	13 – Mosaics of Wildlife Habitat 7B – Scenic Corridors and Viewsheds
07-001.AR1-AR9	120.4	FR 466	13 – Mosaics of Wildlife Habitat 7B – Scenic Corridors and Viewsheds
07-001.AR1-AR7	121.2	FR 1755	13 – Mosaics of Wildlife Habitat

[a] Rx 11-Riparian Corridors occur within the other Rxs.

GWNF Management Prescription 2C3 – Eligible Recreation River Corridor includes rivers that are eligible for the National Wild and Scenic River System under the recreational river designation as well as a 0.25-mile-wide corridor on each side of the waterbody. For river segments that are eligible for designation, their outstandingly remarkable values and free flowing conditions that made them eligible are maintained. The eligible portions of these rivers and the corridors are managed to meet the requirements of the Wild and Scenic Rivers Act of 1968. An access road associated with ACP would be located within this Rx associated with the Cowpasture River Segment B, which is an eligible Recreational river. Current recreation use consists of fishing, canoeing, tubing, and swimming by adjacent landowners and the public along tracts owned by the FS. Public access is limited. Per appendix D of the EIS for the GWNF Forest Plan Revision (2014), the eligibility ratings for the Cowpasture River Segment B are: Class A-distinctive for fish and wildlife values and for historic and cultural values; Class B-common for scenic values and recreational values; and Class C-minimal for geologic values. Road construction or reconstruction is allowed to improve recreational access, improve soil and water, salvage timber or protect property, or public safety. Atlantic proposes the use of FR 281 as a long-term access road within this Rx 2C3 area; however, the existing condition of the road and the need for reconstruction remains a concern of the FS for the potential impacts on the Browns Pond SBA.

GWNF Management Prescription 4A – ANST Corridor emphasizes protecting the ANST experience; preserving and strengthening the role of volunteers and volunteer organizations; providing opportunities for high quality outdoor recreation experiences; and providing for the conservation and enjoyment of the nationally significant scenic, historic, natural, and cultural qualities of the land through which the trail passes. The Rx includes the footpath of the trail and the foreground area visible from the trail and its associated features and facilities. Roads, utility transmission corridors, communication facilities, or signs of mineral development activity exist or may be seen within the prescription area, although the goal is to avoid these types of facilities and land uses to the greatest extent possible and blend facilities which cannot be avoided into the landscape so that they remain visually subordinate. Activities within this Rx should be consistent with the semi-primitive non-motorized Recreation Opportunity Spectrum (ROS) class. New rights-of-way are allowed where major impacts already exist and linear utilities are limited to a single crossing of the prescription area, per project. No new road construction or reconstruction is proposed in this Rx area.

GWNF Management Prescription 4D – SBAs are managed to include lands that support key components and concentrations of the forest's biological diversity. These lands serve as core areas for conservation of the most significant and rarer elements of biological diversity identified to date on the forest. These areas or communities are assemblages of plants and animals that occupy a small portion of the landscape, but contribute significantly to biological diversity. These areas typically include high quality ecological communities such as high elevation mountain tops, shale barrens, caves and karst features, wetlands, and diverse habitat for threatened and endangered species, sensitive and locally rare species. These lands contain individual threatened, endangered, or rare natural communities found within major forest communities. Road construction is allowed in the Rx area with parameters. The Rx 4D area of Browns Pond has a portion of proposed long-term access road FR 281; however, the existing condition of the road and the need for reconstruction remains a concern of the FS.

GWNF Management Prescription 5C – Designated Utility Corridors are areas that contain special uses which serve a public benefit by providing a reliable supply of electricity, natural gas, or water essential to local, regional, and national economies. They include long linear features like high voltage electric transmission lines and buried pipelines for public drinking water or natural gas. These designated corridors serve uses that require at least a 50-foot-wide right-of-way. Local distribution lines are not included in this prescription area, but rather are part of the prescription area in which they are physically located. Road construction is allowed in this Rx area.

GWNF Management Prescription 7E1 – Dispersed Recreation Areas are areas of non-formal camping and recreation that receive moderate to high recreation use. They are managed to provide a variety of dispersed recreation opportunities; improve the settings for outdoor recreation; enhance visitor experiences; and all above are managed in a manner that protects and restores the health, diversity, and productivity of the land. Road construction and utility corridors are allowed in this Rx area. No new road construction is proposed in this Rx area.

GWNF Management Prescription 7B – Scenic Corridors and Viewsheds are areas where high quality scenery is provided in sensitive recreational and travel way settings. Examples include areas adjacent to gateway communities, areas around lakes, rivers, and backdrop areas viewed from major travel ways and state-designated byways. The area visible during leaf-off for up to 0.5 mile from either side of the road typically defines the corridor. It also includes the visible middleground of the west face of Massanutten Mountain (a narrow strip) as seen from the Shenandoah Valley along Interstate 81. No new road construction is proposed in this Rx area.

GWNF Management Prescription 8E4b – Indiana Bat Secondary Cave Protection areas contain habitats that are managed to maintain, restore, and enhance Indiana bat populations. The goals of the secondary cave protection area are to maintain and enhance swarming, roosting, and foraging habitat and to involve regularly scheduled vegetation management activities to maintain and enhance mid- to late-successional oak-hickory forests, open woodland habitats, and the trees that are most likely to develop and retain slabs of exfoliating bark. Commercial timber harvest is frequently the most practical and economical method of achieving these goals. Road construction is allowed within the prescription area only if entering the prescription area is the only feasible and prudent location.

GWNF Management Prescription 11 – Riparian Corridors include the riparian habitat along streams, lakes, wetlands, and floodplains. These corridors are managed to retain, restore, and/or enhance the inherent ecological processes and functions of the associated aquatic, riparian, and upland components within the corridor. These areas are not specifically mapped on the prescription area map but are embedded within other Rxs. Ground disturbing activities are allowed within this prescription if necessary; however, resource effects are minimized by applicable of standards and mitigation measures.

GWNF Management Prescription 13 – Mosaics of Habitat areas are where desired ecosystem and species diversity conditions are managed using timber harvest, prescribed fire, and other management activities. Wildlife habitat management activities provide for both ecological objectives and recreational (hunting and wildlife viewing) objectives; while meeting the demand for timber products through timber harvest, salvage of dead and dying trees, and personal use for firewood. Road construction and linear utility corridors are allowed in this Rx area.

It should be noted that many types of dispersed recreation activities occur and are encouraged within all Rx areas and all lands on the GWNF, and are not limited to, nor solely managed for, within Rx 7E1.

Most management activities within the affected Rxs such as prescribed fire, timber management, and wildfire management activities undertaken on NFS lands would not be affected by operation of the proposed ACP. The principal concerns for these activities with respect to pipeline safety have to do with: 1) excavation or removal of cover on the right-of-way, and 2) any excessive loadings over the line. While the amount of cover over the pipeline would be sufficient to protect the line from fire, any grading or excavation on the right-of-way that might be associated with fire or timber management activities would not be allowed, other than planned activities coordinated with and supervised by the pipeline operator. Similarly, any planned construction of roads or skid trails on the pipeline right-of-way would need to be carefully coordinated with pipeline operations staff to ensure compatibility with pipeline integrity standards. Such activities may, for example, require the addition of extra cover over the pipeline at selected crossing locations. Fire or timber management activities not directly affecting the pipeline right-of-way would not be restricted, unless the activity were to indirectly cause or contribute to undermining or erosion of the right-of-way.

As discussed previously, the GWNF expressed concern with Atlantic's proposed access road 36-016.AR1 at AP-1 MP 96.3 due to sensitive resources and compatibility with LRMP direction for Rx 4D – SBAs (Browns Pond). Therefore, we have recommended above that Atlantic further justify the need for this access road and file a revised *COM Plan* that accurately reflects proposed access roads on FS lands.

Proposed Amendments to Forest Service Land and Resource Management Plans

On November 12, 2015, Atlantic submitted a SUP proposal to the FS to construct, operate, maintain, and eventually decommission a natural gas transmission pipeline that crosses lands and facilities administered by the FS. In addition to potentially issuing a SUP, there is a need for the FS to consider amending affected LRMPs to make provision for ACP right-of-way.

The environmental consequences of the construction and operation of the ACP on the various resources are addressed throughout section 4 of this final EIS. This section describes why LRMP amendments are needed, what those amendments are, and how the amendments would meet the NFMA requirements.

The NFMA requires that proposed projects, including third-party proposals subject to permits or rights-of-way, be consistent with the LRMP (or Forest Plan) of the administrative unit where the project would occur. When a project would not be consistent with the LRMP where the project would occur, the FS has the following options (36 CFR 219.15(c)):

1. modify the proposed project or activity to make it consistent with the applicable plan components;

2. reject the proposal or terminate the project or activity;

3. amend the plan so that the project or activity will be consistent with the plan as amended; or

4. amend the plan contemporaneously with the approval of the project or activity so that the project or activity will be consistent with the plan as amended. This amendment may be limited to apply only to the project or activity.

The linear nature of the pipeline corridor and the topography of the MNF and GWNF make it difficult to avoid every circumstance that would be inconsistent with the management direction and standards in the LRMPs. Atlantic has cooperated with the FS to make its proposal consistent with the Forest Plans where feasible and include additional mitigation measures. Even with several route adjustments and modified project design features, the FS has determined that if the SUP would be approved for the proposed route crossing, the Forest Plans would require amendment. With an amendment, ACP would then be consistent with the Forest Plans.

Forest Plan amendments are guided by direction in the NFMA planning rule regulations (36 CFR 219.5 and 219.13). The planning rule was amended on December 15, 2016, to clarify direction for Forest Plan amendments. In particular, the Responsible Official is required to determine if a proposed Forest Plan amendment is directly related to the substantive requirements of § 219.8 through 219.11. and 36 CFR 219.13(b)(5). These substantive requirements address sustainability, diversity of plant and animal communities, multiple use, and timber requirements. A proposed amendment is “directly related” to a substantive requirement if it has one or more of the following relationships to the substantive requirement: the purpose for the amendment; there would be a beneficial effect of the amendment; there would be a substantial adverse effect of the amendment; or there would be a lessening of plan protections by the amendment. If a proposed amendment is determined to be “directly related” to a substantive rule requirement, the Responsible Official must apply that requirement within the scope and scale of the proposed amendment and, if necessary, adjust the proposed amendment to meet the requirement (36 CFR 219.13 (b)(5) and (6)).

The Forest Plan amendments proposed by the FS are needed because ACP cannot meet several Forest Plan standards that are intended to protect soil, water, riparian, visual, old growth and recreational resources, threatened, endangered, and proposed species. Standards are mandatory constraints on project and activity decision-making, established to help achieve or maintain desired conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)). The wording of some standards contains flexibility to allow for site-specific adaptation to meet the intent of the standard. However, the standards identified as needing to be amended do not have such flexibility.

The following section discusses the LRMP amendments that were proposed at the time of the draft EIS, the revised amendments proposed in the final EIS, and the relationship of the proposed amendments to the substantive requirements of the 2012 Planning Rule.

Potential LRMP Amendment for the Monongahela National Forest Proposed at the Time of the Draft EIS

The MNF LRMP may be amended to allow construction of ACP to temporarily exceed standards identified under management direction for soils and water, specifically forest-wide standards SW06 and SW07, provided that design criteria, mitigation measures, project requirements, and/or monitoring activities agreed to by the FS are implemented as needed.

The specific standards identified in the potential amendment included:

- **Standard SW06:** Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area.

- **Standard SW07:** Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site conditions:

  a) Steep Slopes (40 to 50 percent) – Operations on these slopes shall be analyzed on a case-by-case basis to determine the best method of operation while maintaining soil stability and productivity.

  b) Very Steep Slopes (more than 50 percent) – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.

  c) Susceptible to Landslides – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.

  d) Soils Commonly Wet at Or Near the Surface During a Considerable Part of The Year or Soils Highly Susceptible to Compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur.

The draft EIS acknowledged that Atlantic was working on design criteria, additional mitigation measures, project requirements, and/or monitoring activities to meet the intent of the LRMP standards, and the criteria and measures were to be identified in the draft *COM Plan*.

Revised LRMP Amendment Description for the Monongahela National Forest

Since the draft EIS, the FS has reviewed new information and analyses and worked with Atlantic to develop project features and mitigation measures that are designed to meet the intent of forest plan components which may need variances to allow for the construction and operation of the ACP relating to soil resources, threatened, endangered, and proposed species. When the BE is revised after field surveys have been completed, additional mitigation measures may be required to keep the project consistent with all forest plan components. These measures would be included within the *COM Plan* and SUP.

The revised proposed amendment to the MNF LRMP consists of two parts and includes the determination of the relationship of the amendment to the substantive requirements of the planning rule (36 CFR 219.8 through 219.11). All parts of the plan amendment are project-specific, meaning that they apply only to ACP, and would have no bearing on any other on-going or future projects.

Monongahela National Forest Proposed Amendment, Part 1

This part includes standards SW06 and SW07 which were identified in the draft EIS. Based on current information available to the FS, forestwide standard SW03 (shown below) also needs amendment. Standards SW03 and SW07 are contingent on the outcome of specific design features and mitigation related to soils.

- Standard SW03: Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time soil is exposed on disturbed sites or retained in an impaired condition.

The proposal to amend these standards is:

- Standard SW03: Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function **except for the construction, restoration, and rehabilitation activities associated with ACP where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented**. The intent is to minimize the time soil is exposed on disturbed sites or retained in an impaired condition.

- Standard SW06: Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area **except for the construction of ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.**

- Standard SW07: Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site conditions:

  a) <u>Steep Slopes (40 to 50 percent)</u> – Operations on these slopes shall be analyzed on a case-by-case basis to determine the best method of operation while maintaining soil stability and productivity.

  b) <u>Very Steep Slopes (more than 50 percent)</u> – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.

  c) <u>Susceptible to Landslides</u> – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.

d) <u>Soils Commonly Wet at Or Near the Surface During a Considerable Part of The Year or Soils Highly Susceptible to Compaction</u>. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur.

However, this requirement would not apply to the construction, operation and maintenance, and restoration and rehabilitation of the ACP where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.

The following is a summary of the major applicable mitigation measures from the draft *COM Plan*:

- To protect soil productivity, topsoil segregation would be required on NFS lands (Section 8-*Upland Erosion Control Plan*, Section 10-*Restoration and Rehabilitation Plan*). The FS has requested that topsoil segregation be implemented along the entire route on NFS lands, or where it is not possible, to provide alternative methods for restoring soil productivity. The FS and Atlantic are still discussing topsoil segregation and soil decompaction needs.[20]

- The applicable mitigation measures designed to minimize the potential for soil movement and to ensure adequate restoration and revegetation are identified in the draft *COM Plan* (Section 8-*Upland Erosion Control Plan*, Section 10-*Restoration and Rehabilitation Plan*, Attachment C-*Slope Stability Policy and Procedure*, Attachment H- *Karst Monitoring and Mitigation Plan*), and Geohazard Mitigation Site-Specific Site Designs. The BIC Team and the SAIPR provide design and construction practices for steep terrain. Atlantic would also follow the FERC *Plan* and West Virginia and Virginia state requirements and BMPs. The FS is still working with Atlantic on site-specific designs which would be used to minimize the potential risks for sliding and other slope instabilities and would require additional site designs.

- The applicable mitigation measures in the draft *COM Plan* to minimize compaction include the FERC *Plan* and *Procedures*, and the *Restoration and Rehabilitation Plan*.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

§ 219.8(a)(2)(ii) – [A plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation"

Section 4.2.7 of the final EIS provides descriptions of the effects of the pipeline and associated activities on the soil resources on the MNF. Discussions are ongoing concerning the mitigation measures to minimize the effects on soil resources and the *COM Plan* would include measures to adequately address topsoil segregation, soil decompaction, slope stability, and the minimization of the potential for soil movement. With these mitigation measures in place, there would not be any substantial adverse effects on the soil resources. Therefore, the § 219.8(a)(2)(ii) planning rule requirement would not be "directly related" to this amendment and it would not apply.

Monongahela National Forest Proposed Amendment, Part 2

Since the draft EIS release, the FS has examined newly available information, including survey reports and information updates as they become available from Atlantic related to ESA-protected species and FS-managed species. Some surveys are pending and FERC has stated the draft BE submitted March

[20] FERC eLibrary Accession number 20170406-5440.

10, 2017 is incomplete (see section 4.7.3). The FS has compared this new information to LRMP components related to threatened, endangered and potential species and has identified a LRMP standard that needs amendment contingent on agreement on avoidance and minimization measures. Based on current information available to the FS, forestwide standard TE07 (shown below) needs amendment.

- Standard TE07: Special use permits may be authorized in TEP species habitat if the uses do not adversely affect populations or habitat. This standard does not apply to Indiana bat or running buffalo clover. See special use direction for these species, [in the MNF LRMP].

The proposal to amend this standard is:

- TE07: Special use permits may be authorized in TEP species habitat if the uses do not adversely affect populations or habitat**. However, this requirement will not apply to the ACP SUP for the northern long-eared bat where the applicable mitigation measures identified in the *COM Plan* and SUP will be implemented.** This standard does not apply to Indiana bat or running buffalo clover. See special use direction for these species, [in the MNF LRMP].

The 36 CFR planning rule requirement that are relevant to this part of the proposed amendment are:

> § 219.9(a)(2)(ii) – [The plan must include plan components … to maintain or restore the diversity of ecosystem and habitat types throughout the plan area. In doing so, the plan must include components to maintain or restore] "rare aquatic and terrestrial plant and animal communities."
>
> § 219.9(b) – "Additional, species-specific plan components" [determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area. If … the plan components required in paragraph (a) are insufficient to provide such ecological conditions, then additional, species-specific plan components, must be included in the plan to provide such ecological conditions in the plan area.]

Section 4.7.1 of the final EIS for the project provides descriptions of the effects of the pipeline and associated activities on the threatened, endangered, and proposed and under review species. Discussions are ongoing concerning pending surveys, avoidance and minimization measures, project design features, and mitigation measures to minimize the effects on northern long-eared bat. The *COM Plan* would include mitigation measures to adequately address northern long-eared bat. Therefore, the § 219.9(a)(2)(ii) and § 219.9(b) planning rule requirements would not need to be applied to this amendment.

The 36 CFR 219 planning rule requirement that is relevant to the proposed MNF LRMP amendment is:

> § 219.10(a)(3) – "[The responsible official shall consider] Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors."

The requirement to consider the appropriate placement and management of utility corridors is addressed throughout this EIS. Alternatives for the location of the pipeline through the MNF have been considered through the planning process for the pipeline, and the applicable mitigation and monitoring measures to minimize the effects of the pipeline on the other resources have been identified in the draft

COM Plan. Atlantic and the FS are engaged in ongoing communications to develop other necessary measures to avoid and minimize impacts on NFS lands, and these communications would likely continue as the project proposal continues to be refined. Any revisions or modifications to the *COM Plan* that are not described in this EIS would also be included as requirements in the SUP.

<u>LRMP Amendment that was Proposed at the Time of the Draft EIS for the George Washington National Forest</u>

Draft EIS Proposed Amendment, Part 1: The GWNF LRMP would be amended to reallocate 104.2 acres to the Rx 5C–Designated Utility Corridors from these Rxs: Rx 7E1–Dispersed Recreation Areas (about 7 acres), and Rx 13–Mosaics of Habitat (about 96 acres). Rx 11-Riparian Corridors would remain embedded within the new Rx 5C area.

This amendment part would have changed land allocations and future management direction for the lands reallocated to the new Rx that would encourage the collocation of potential future utility corridors. The amendment would also have made the new Rx 5C area 50 feet wide. The need for this amendment came from two forestwide standards in the Forest Plan that apply to linear rights-of-way and communication sites:

- Standard FW-243: Develop and use existing corridors and sites to their greatest potential to reduce the need for additional commitment of lands for these uses. When feasible, expansion of existing corridors and sites is preferable to designating new sites.

- Standard FW-244: Following evaluation of the above criteria, decisions for new authorizations outside of existing corridors and designated communication sites would include an amendment to the Forest Plan designating them as Rx Area 5B or 5C.

Draft EIS Proposed Amendment, Part 2: The GWNF LRMP would be amended to allow construction of the ACP to exceed restrictions on soil conditions and riparian corridor conditions as described in forestwide FW-5, FW-15, FW-16, FW-17, and management prescription 11-019 standards, provided that mitigation measures or project requirements agreed upon by the FS are implemented as needed.

The specific standards from the LRMP that were proposed for amendment are shown below:

- Standard FW-5: On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat would be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years.

- Standard FW-15: Motorized vehicles are restricted in the channeled ephemeral zone to designated crossings. Motorized vehicles may only be allowed on a case-by-case basis, after site-specific analysis, in the channeled ephemeral zone outside of designated crossings.

- Standard FW-16: Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone.

- Standard FW-17: In channeled ephemeral zones, up to 50 percent of the basal area may be removed down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case-by-case basis when needed to benefit riparian-dependent resources.

- Standard 11-019: Tree removals from the core of the riparian corridor may only take place if needed to: enhance the recovery of the diversity and complexity of vegetation native to the site; rehabilitate both natural and human-caused disturbances; provide habitat improvements for aquatic or riparian species, or threatened, endangered, sensitive, and locally rare species; reduce fuel buildup; provide for public safety; for approved facility construction/renovation; or as allowed in standards 11-015 or 11-024.

Draft EIS Proposed Amendment, Part 3: The GWNF LRMP would be amended to allow ACP to cross the ANST in Augusta County, Virginia.

The specific management prescription standard related to the ANST from the LRMP that was proposed for amendment is shown below:

- Standard 4A-025: Locate new public utilities and rights-of-way in areas of this Rx area where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the Rx area per project.

Draft EIS Potential Amendment, Part 4: The GWNF LRMP may be amended to allow the removal of old growth trees within the construction corridor of ACP.

This amendment was contingent on the completion of the old growth survey. The specific forestwide standard from the LRMP that was proposed for a potential amendment is shown below:

- Standard FW-85: During project planning, inventory any stands proposed for timber harvest for existing old growth conditions using the criteria in appendix B (*Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region* [Forestry Report R8-FR 62, June 1997]). Any stands in Old Growth Forest Types 1 (Northern Hardwood), 2a (Hemlock-Northern Hardwood), 2b (White Pine-Northern Hardwood), 2c (Spruce Northern Hardwood), 5 (Mixed Mesophytic), 10 (Hardwood Wetland Forests), 22 (Dry and Xeric Oak Forest), 24 (Xeric Pine and Pine-Oak Forest and Woodland), 28 (Eastern Riverfront) that meet the age criteria for old growth would be unsuitable for timber production, regardless of whether they meet the other criteria for existing old growth. Stands in Old Growth Forest Types 21 (Dry Mesic Oak) or 25 (Dry & Dry-Mesic Oak-Pine) may be suitable for timber harvest. Decisions to harvest these stands would be made after consideration of the contribution of identified patches to the distribution and abundance of the old growth community type and to the desired condition of the appropriate prescription during project analysis.

Draft EIS Potential Amendment, Part 5: The GWNF LRMP may be amended to allow major reconstruction of a Forest Road within a Rx 2C3 area to provide access for pipeline construction.

The amendment was contingent on the final access road determination. The specific management prescription standard related to Eligible Recreational River areas from the LRMP that was proposed for a potential amendment is shown below:

- Standard 2C3-015: Allow road construction or reconstruction to improve recreational access, improve soil and water, to salvage timber, or to protect property or public safety.

Draft EIS Potential Amendment, Part 6: The GWNF LRMP may be amended to allow ACP to not immediately meet Scenic Integrity Objectives (SIOs); however, mitigation measures, including vegetation management and restoration actions, are expected to improve visual quality over an extended timeframe.

This amendment was contingent on the final Visual Impact Assessment (VIA). The specific forestwide standard from the LRMP that was proposed for a potential amendment is shown below:

- Standard FW-182. The Forest SIOs are met for all new projects (including special uses). Existing conditions may not currently meet the assigned SIO.

Revised LRMP Amendment Descriptions in the Final EIS for the George Washington National Forest

Since the draft EIS, the FS has reviewed new information and analyses and worked with Atlantic to develop project features and mitigation measures that are designed to meet the intent of the proposed exempted standards relating to soil, riparian, visual, old growth, and recreational resources. The most critical mitigation measures or project features relating to the proposed exempted standards are highlighted below.

The revised proposed amendment to the GWNF LRMP, which consists of six parts, is described below and includes the determination of the relationship of the proposed amendment to the substantive requirements (36 CFR 219.8 through 219.11) of the planning rule. All parts of the amendment would be project-specific, meaning that they apply only to ACP and would not have any bearing on any other projects or future projects.

George Washington National Forest Amendment, Part 1:

After further consideration and review of public comments received on the draft EIS, the FS no longer proposes a land allocation change to the Rx 5C-Designated Utility Corridors. This proposed amendment is being replaced with a project-specific amendment that would exempt the ACP right-of-way, if approved, from forestwide standard FW-244 that would require the Rx reallocation.

The FS has determined that a specific amendment to FW-243 is not needed. The option of collocating the pipeline within existing utility corridors was considered by Atlantic (see section 3.3), but determined to not be feasible on NFS lands because an avoidance of the MNF and GWNF to the south or to the north would result in increased mileage and there were no significant environmental advantages identified compared to the proposed route (see section 3.3.4.1).

The FS has also decided it is preferable to not reallocate the ACP right-of-way corridor to the Rx 5C that encourages future collocation opportunities. While other linear utilities could be proposed to collocate with this corridor in the future, such an option is not likely to be technically and/or environmentally feasible. In addition, it has been determined that the scope of this EIS should not be expanded to include the possibilities of future utility facilities being collocated within the corridor associated with the ACP pipeline as in the amendment proposed in the draft EIS. Therefore, the operational right-of-way needed for the ACP would remain within the existing management prescriptions. There is, however, still the need to address the FW-244 standard, shown below, that would require the reallocation of the lands within the ACP operational right-of-way grant to the Rx 5C-Designated Utility Corridor.

- Standard FW-244: "… decisions for new authorizations outside of existing corridors and designated communication sites would include an amendment to the Forest Plan designating them as management prescription (Rx) Area 5B or 5C."

The new proposal is to amend Standard FW-244 as follows:

- Standard FW-244: Following evaluation of the above criteria, decisions for new authorizations outside of existing corridors and designated communication sites would include an amendment to the Forest Plan designating them as Rx 5B or 5C. **However, this requirement would not apply to the operational right-of-way associated with the ACP.**

With this amendment, the lands would remain in the existing management prescriptions of Rx 4A-ANST, Rx 7E1–Dispersed Recreation Areas, Rx 13–Mosaics of Habitat and embedded Rx 11-Riparian Corridors.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

> § 219.10(a)(3) – "[The responsible official shall consider] Appropriate placement and sustainable management of infrastructure, such as recreational facilities and transportation and utility corridors."

The requirement to consider the appropriate placement and management of utility corridors is addressed throughout this EIS. Various alternatives for the location of the pipeline through the GWNF have been considered through the planning process for the pipeline, and the applicable mitigation and monitoring measures to minimize the effects of the pipeline on the other resources are identified in the *COM Plan.* Atlantic and the FS are engaged in ongoing communications to develop measures to avoid and minimize impacts on NFS lands, and these communications would likely continue as the project proposal continues to be refined.

George Washington National Forest Amendment, Part 2:

Since the draft EIS was issued, the FS has more closely examined the standards related to soil, water, and riparian areas and has determined that management prescription Standard 11-019 allows for tree removal in riparian areas for approved facility construction. Motorized vehicles in the channeled ephemeral zone (FW-15) can occur after a site-specific analysis. So, if ACP is approved, these activities associated with the ACP would be consistent with these standards and there is no need for exemption. However, two additional standards have been identified that would require an exemption, forestwide standard FW-8 and management prescription standard 11-003. It is now proposed to amend the standards in the GWNF LRMP that are listed below to allow the construction and operation of the ACP to exceed these restrictions on soil conditions and riparian corridor conditions and to require that the mitigation measures set out in the *COM Plan* and SUP that are applicable to the protection of soil and riparian conditions would be implemented.

The new proposal is to amend these standards listed below as follows:

- Standard FW-5: On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat would be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years, **except for the operational right-of-way and the construction zone for the ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.**

- Standard FW-8: Water saturated soils in areas expected to produce biomass should not receive vehicle traffic or livestock trampling to prevent excessive soil compaction, **except for the operational right-of-way and the construction zone for the ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.**

- Standard FW-16: Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone, **except for the operational right-of-way and the**

construction zone for the ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.

- Standard FW-17: Up to 50 percent of the basal area may be removed, down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case-by-case basis when needed to benefit riparian-dependent resources, **except for the operational right-of-way and the construction zone for the ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.**

- Standard 11-003: Management activities expose no more than 10 percent mineral soil within the project area riparian corridor, **except for the operational right-of-way and the construction zone for the ACP, where the applicable mitigation measures identified in the *COM Plan* and SUP would be implemented.**

The following is a summary of the major applicable mitigation measures from the draft *COM Plan*:

- To protect soil productivity, topsoil segregation would be required on NFS lands (Section 8-*Upland Erosion Control Plan*, Section 10-*Restoration and Rehabilitation Plan*). The FS has requested that topsoil segregation be implemented along the entire route on NFS lands, or where it is not possible, to provide alternative methods for restoring soil productivity. On May 26, 2017, Atlantic indicated that 2.4 miles of the route through NFS lands would be feasible for topsoil segregation and that soil amendments would be added where necessary. The FS and Atlantic are still discussing topsoil segregation and soil decompaction needs.[21]

- The applicable mitigation measures designed to minimize the potential for soil movement and to ensure adequate restoration and revegetation are identified in the draft *COM Plan* (Section 8-*Upland Erosion Control Plan*, Section 10-*Restoration and Rehabilitation Plan*, Attachment C-*Slope Stability Policy and Procedure*, Attachment H-*Karst Monitoring and Mitigation Plan*), and Geohazard Mitigation Site-Specific Site Designs. The BIC Team and the SAIPR provide design and construction practices for steep terrain. Atlantic would also follow the FERC *Plan* and West Virginia and Virginia state requirements and BMPs. The FS is still working with ACP on site-specific designs which would be used to minimize the potential risks for sliding and other slope instabilities and would require additional site designs.

- The applicable mitigation measures in the draft *COM Plan* to protect wetlands and minimize compaction include the Stream and Wetland Crossing Procedures and the *Restoration and Rehabilitation Plan*. Atlantic would also follow the FERC *Procedures*.

- The applicable mitigation measures and monitoring requirements in the draft *COM Plan* relating to water crossings are included in Section 9-Stream and Wetland Crossing Procedures.

[21] FERC eLibrary Accession number 20170406-5440.

The 36 CFR 219 planning rule requirements that are relevant to this part of the proposed amendment are:

> § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore …] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation"
>
> § 219.8(a)(2)(iv) – [The plan must include plan components to maintain or restore …] "Water resources in the plan area, including lakes, streams, and wetlands; … and other sources of drinking water (including guidance to prevent or mitigate detrimental changes in quantity, quality, and availability)"
>
> § 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity"

Sections 4.2.7 and 4.3.3.9 of the final EIS provide descriptions of the effects of the pipeline and associated activities on the soil resources and wetlands on the GWNF. Discussions are ongoing with ACP concerning the mitigation measures to minimize the effects on soil, riparian and wetland resources and the *COM Plan* would include measures to adequately address restoration of soil productivity, soil decompaction, the minimization of the potential for soil movement and protection of wetlands. With these mitigation measures in place, there would not be any substantial adverse effects on the soil, riparian and wetland resources. Therefore, the § 219.8(a)(2)(ii)-(iv) and § 219.8(a)(3)(i) planning rule requirements would not be "directly related" to this amendment and they would not apply.

George Washington National Forest Amendment, Part 3:

Standard 4A-025 (shown below) within the Management Prescription 4A – ANST Corridor, would need to be amended because the location of the pipeline crossing the ANST would occur where no other major impacts already exist.

- Standard 4A-025: Locate new public utilities and rights-of-way in areas of this management prescription area where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the prescription area, per project.

The new proposal is to amend this standard as follows:

- Standard 4A-025: Locate new public utilities and rights-of-way in areas of this management prescription area where major impacts already exist, **except for the ACP right-of-way.** Limit linear utilities and rights-of-way to a single crossing of the prescription area, per project.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

> § 219.10(b)(1)(vi) – "[The plan must include plan components to provide for] Appropriate management of other designated areas or recommended designated areas in the plan area"

In addressing the § 219.10(b)(1)(vi) requirement, as a part of the mitigation for crossing the ANST, the project design specifies that the pipeline would use the HDD method to install the pipeline underneath the ANST. This would result in no ground disturbance within the Rx4A - ANST Corridor on NFS lands. Should the HDD method under the ANST fail, ACP would utilize the methods described in the draft *COM Plan* Attachment P-*Contingency Plan for the ANST and the BRP Crossing*. The contingency plan does not include an open trench crossing of the ANST. The contingency methods include reattempting the HDD or using the direct pipe method (trenchless) on NFS lands.

George Washington National Forest Amendment, Part 4:

Forestwide standard FW-182 (shown below) would need to be amended since the operational right-of-way of the pipeline cannot immediately meet all the existing SIOs.

- Standard FW-182: The Forest SIOs are met for all new projects (including special uses). Existing conditions may not currently meet the assigned SIO.

The proposal is to amend this standard as follows:

- Standard FW-184: The Forest SIOs are met for all new projects (including special uses), **except for the ACP right-of-way. ACP would meet the existing SIOs within five years after completion of the construction phase of the project for all areas, except for the immediate foreground of the Shenandoah Mountain Trail crossing where the project would meet the SIO of Low.** Existing conditions may not currently meet the assigned SIO.

The 36 CFR 219 planning rule requirement that is relevant to this part of the proposed amendment is:

§ 219.10(b)(1)(i) – [The plan must include plan components to provide for …] "Sustainable recreation; … and scenic character."

In addressing the § 219.10(b)(1)(i) requirement (to provide for scenic character), as described in this final EIS, mitigation measures would include reducing the permanent operational right-of-way that is converted to herbaceous cover from 50 feet wide to 10 feet wide and for its length on the GWNF and planting the remainder of the permanent right-of-way with FS approved shrubs and shallow rooted trees and maintained along a slightly undulating line in order to break up the straight edge and offer a variety of plant heights to reduce a hard shadow line. This would significantly reduce the visibility of the pipeline, especially when viewed in the far middleground and background distance zones, and it would reduce or eliminate its visibility when viewed on an angle. Reducing the herbaceous right-of-way width and allowing more of a vegetative transition within the operational corridor (i.e., grasses over the pipeline then shrubs between the grasses and treeline) would help mitigate the effects of the change to the scenic character of the area. (See also the mitigation measures for addressing the effects of the pipeline on the visual resources that are described in the following section and in the *COM Plan*). The existing SIO where the pipeline would intersect and follow the Shenandoah Mountain Trail is Moderate. Although mitigations would lessen the visual effects, the SIO would not be met. It is anticipated that a final VIA would be available before the final decisions on the plan amendments and special use authorization are made, and the *COM Plan* would be adjusted accordingly.

George Washington National Forest Amendment, Part 5:

At this time, Atlantic has not completed an old growth inventory in accordance to the "Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region" (Forestry Report R8-FR 62, June 1997) as required in forestwide standard FW-85. If Atlantic does not complete the old growth inventory, FW-85 (shown below) would need to be amended for the pipeline construction to be consistent with the LRMP.

- Standard FW-85: Inventory any stands proposed for timber harvest for existing old growth conditions using the criteria in appendix B (*Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region* [Forestry Report R8-FR 62, June 1997]). Any stands in Old Growth Forest Types 1 (Northern Hardwood), 2a (Hemlock-Northern Hardwood), 2b (White Pine-Northern Hardwood), 2c (Spruce Northern Hardwood), 5 (Mixed Mesophytic), 10 (Hardwood Wetland Forests), 22 (Dry and Xeric Oak Forest), 24 (Xeric Pine and Pine-Oak Forest and Woodland), 28 (Eastern Riverfront) that meet the age criteria for old growth would be unsuitable for timber production, regardless of whether they meet the other criteria for existing old growth. Stands in Old Growth Forest Types 21 (Dry Mesic Oak) or 25 (Dry and Dry-Mesic Oak-Pine) may be suitable for timber harvest. Decisions to harvest these stands would be made after consideration of the contribution of identified patches to the distribution and abundance of the old growth community type and to the desired condition of the appropriate prescription during project analysis.

The 36 CFR 219 planning rule requirement that is relevant to this part of the possible amendment is:

> § 219.8(a)(1) – "The plan must include plan components, including standards and guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity."

To address the intent of Standard FW-85, Atlantic provided an estimate of late seral trees using aerial imagery, and the FS conducted an estimate of "possible" old growth using age and forest type within the agency's vegetation database. These estimates are described in section 4.4.8. Based on a database inventory, the FS estimates that approximately 26 percent of the acres cleared for construction and operation of ACP are considered possible old growth. The three major forest community types receiving the impacts on possible old growth are also the most common community types on the GWNF, and these community types have the highest representation of possible old growth forestwide (Dry-Mesic Oak, Dry and Dry-Mesic Oak, and Xeric Pine and Pine-Oak). Considering the clearing of these project acres, there would still be an estimated 345,000 acres of possible old growth in these community types across the GWNF in 2020, representing about 37 percent of the acres in those community types. Typically, an estimate of possible old growth that is based on minimum age in a database would overestimate the amount of existing old growth because of the influence of the three additional operational criteria in the definition for existing old growth outlined in the R8 protocol. Therefore, the FS would expect that any existing old growth that would harvested by ACP activities would likely be less than the 82 acres of possible old growth.

Given the amount of the impacted possible old growth compared to the amount identified across the entire Forest, it is not likely that there would be any "substantial adverse effects" to the existing old growth communities on the GWNF. Consequently, should a plan amendment be necessary, it is not likely that additional plan components would need to be added to this amendment to meet the planning rule requirements at §219.8(a)(1). A final determination as to the need for this amendment would be disclosed in the Final ROD.

George Washington National Forest Amendment, Part 6:

The need for this amendment is contingent on the final access road determination, which the FS is still negotiating with Atlantic due to concerns about possible impacts to a SBA outside of the Rx 2C3-Eligible Recreational River area. If it is determined that FR 281 needs to be reconstructed, Standard 2C3-015 would need to be amended as follows:

- Standard 2C3-015: Allow road construction or reconstruction to improve recreational access, improve soil and water, to salvage timber, or to protect property or public safety. **The reconstruction of FR 281, which is needed as a long-term access road for ACP, would also be allowed.**

The 36 CFR 219 planning rule requirement that is relevant to this part of the amendment, if needed, is:

§ 219.10(b)(v) – "Protection of designated wild and scenic rivers as well as management of rivers found eligible or determined suitable for the National Wild and Scenic River system to protect the values that provide the basis for their suitability for inclusion in the system."

The reconstruction of FR 281 within the Rx 2C3 area would not substantially affect the outstandingly remarkable values associated with the Cowpasture River Segment B that include: Class A-distinctive for fish and wildlife values and for historic and cultural values; Class B-common for scenic values and recreational values; and Class C-minimal for geologic values. The road would remain closed for public access. This planning rule requirement would be addressed.

The final determination as to the need for this amendment would be made in the Final ROD.

Recreation and Special Interest Areas

In general, FS management direction for recreational resources is found within the following FS documents:

- FSM 2300 – Recreation, Wilderness, and Related Resource Management;
- FSM 2710 – Special Use Authorizations;
- FSM 2720 – Special Uses Administration;
- FSM 2353.15 – National Quality Standards for Trails;
- FS Handbook (FSH) 2309.18 – Trails Management Handbook;
- FSH 2709.11 – Special Uses Handbook; and
- LRMPs.

Similar to non-federal lands, the primary concerns when crossing a designated recreation or special interest area are the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, resources the area aims to protect); altering the aesthetics by removing existing vegetation and disturbing soils; interfering with or diminishing the quality of the recreational experience by affecting wildlife movements or disturbing trails; and limiting access to these areas during construction activities. In general, direct project impacts on recreational and special interest areas occurring outside of forested land would be minor and temporary (limited to the period of active construction), which typically would last only several days to several weeks in any one area. On federal lands, Atlantic would minimize project-related impacts by implementing the *COM Plan*, which is currently in draft format and under review by the MNF and GWNF.

One aspect of the draft *COM Plan* is the *Public Access Plan*, which identifies measures to notify recreational users of the project and promotes the safety of recreational users of MNF and GWNF lands during pipeline construction. The following applies to ACP on all federal lands, including the recreation areas discussed further by forest below.

- Prior to and during construction, Atlantic's public affairs representatives would work with FS public affairs specialists to provide updated project information for communication to forest users and to plan and implement any targeted outreach to particular groups of forest users (e.g., hiking, hunting, or fishing organizations).

- Prior to ACP construction activity on the MNF and GWNF, Atlantic, in consultation with the MNF and GWNF staff, would post temporary signs on FS roads used as construction access roads alerting road users to the presence of logging and construction vehicles on the roads. Atlantic would be required to consult with FS on the wording for these signs, which would consider that all types of non-motorized recreational users may use roads as legitimate routes open to hikers, mountain bicyclists, and/or equestrians.

- Prior to construction, Atlantic would work with MNF and GWNF staff to identify any specific road or trail closures or detours necessary to facilitate pipeline construction and ensure safety of the public.

- On roads that cross the pipeline right-of-way, Atlantic would post temporary signs informing road and trail users of any closures, detours, or other restrictions associated with crossing the construction zone. All signage would be developed in consultation with FS public affairs specialists.

- On FS roads remaining open during construction, Atlantic would employ flagmen during periods of active construction at road/pipeline right-of-way intersections, when construction equipment or vehicles may be crossing the road.

- On FS trails that cross the pipeline right-of-way and remain open during construction, Atlantic would erect exclusion fencing on either side of the trail where it crosses the construction zone, with appropriate signage warning all trail users to stay on the trail. During periods of active construction when vehicles and equipment may be crossing over the trail, Atlantic would employ flagmen/spotters to escort all trail users safely across the construction zone. If temporary trail detours are employed, detour routes would be developed in consultation with FS recreational specialists and the detour routes would be prominently demarcated.

As previously discussed, the *COM Plan* is currently being revised to incorporate comments filed by the FS with the FERC on April 6, 2017. There may be additional measures required by the agencies to be in compliance with the respective LRMP.

Following construction, most open land uses would be able to revert to their former uses. Forest land affected by the temporary construction right-of-way and ATWS areas, however, would experience long-term impacts because of the time required to restore the woody vegetation to its preconstruction condition (at least 20 years). Forest land within the operational right-of-way, would experience long-term impacts because of a land use and vegetation type conversion. However, operation of ACP would not interfere with recreational activities, as discussed further below.

Monongahela National Forest

The MNF provides over 50 percent of the outdoor recreation opportunities on public land in West Virginia (FS, 2011). Approximately 1.3 million visitors come to the MNF each year. Recreational opportunities vary and include bicycling, camping and cabins, climbing, fishing, hiking, horse riding, hunting, nature viewing, outdoor learning, picnicking, scenic driving, water activities (boating, swimming), and winter sports such as snowshoeing and cross-country skiing (FS, 2016g). The forest offers many designated and developed recreational sites, and activities like biking and horse riding are generally allowed throughout. Hunting is allowed throughout the MNF, except in designated safety zones (e.g., developed recreation sites) and other areas that may be closed by order of the Forest Supervisor (FS, 2016h).

Recreation Opportunity Spectrum

The ROS is a classification tool used by FS managers to delineate, define, integrate, and monitor outdoor recreation opportunities in land and resource management planning based on the natural, managerial, and social environment (FS, 2011; 2014). Five ROS classes have been identified by the FS: primitive (P); semi-primitive non-motorized (SPNM); semi-primitive motorized (SPM); roaded natural (RN); and rural (R). As listed in table 4.8.9-8, there are no P, SPNM, or R crossed by the project and, therefore, they are not discussed below.

TABLE 4.8.9-8

Recreation Opportunity Spectrum Areas on the Monongahela National Forest Crossed by the Atlantic Coast Pipeline [a]

Recreation Opportunity Spectrum Area	Begin Milepost	End Milepost	Miles Crossed [b]	Impacts (acres)	
				Construction	Operation
Roaded Natural	73.1	73.6	0.8	12.0	4.6
Roaded Natural	80.5	80.9	0.5	7.5	3.0
Semi-primitive Motorized	81.2	82.9	2.4	47.1	20.5
Roaded Natural	82.9	83.9	1.5	20.3	9.2
Project Total			5.2	86.9	37.3

[a] Features crossed are along the AP-1 mainline. Includes construction and operational pipeline right-of-way and ATWS.
[b] Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost. However, the project total miles crossed represent the actual distance.
Source: FS, 2011; 2014

The following describes the general characteristics of each ROS crossed by the project as described by the MNF LRMP (2011) and GWNF LRMP (2014).

- SPM: Area characterized by a predominantly natural or natural appearing environment of 2,500 or more acres, with a moderately high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk. Motorized use is permitted.

- RN: Area characterized by a predominantly natural or natural-appearing environment with a low probability of experiencing isolation from the sights and sounds of man. Interaction between users may be low to moderate, but with evidence of other users prevalent. Conventional motorized use is provided for in construction standards and design of facilities. Opportunities for both motorized and non-motorized forms of recreation may be provided.

As also discussed in section 4.8.5, recreationists may encounter construction activities most likely in the form of visual and noise impacts, which would affect their experience of NFS lands. Recreationists may not be able to access certain tracts of land, depending on where construction is occurring at any given time. Construction noise would be heard by nearby recreationists and vegetation and wildlife would be displaced, affecting recreationists' enjoyment of these resources. These impacts would temporary and not significant since the areas outside of the construction workspace would remain available.

During operation of ACP, specifically the maintained herbaceous right-of-way through the forested landscape setting, the designated areas of SPM would be effected. The USDA FS 1986 ROS Book states, "The apparent naturalness of an area is highly influenced by the evidence of human developments. When a landscape is obviously altered by … pipelines…, the area will not be perceived as being predominantly natural. Even if the total acres of modified land is relatively small, "out of scale" modifications can have a negative impact." Operation of ACP would have less impact on the RN designated settings where the overall perception is one of naturalness, but evidence of human activities can vary from area to area. Outside of the permanent right-of-way, which would result in the conversion of forested land to open land, experiencing isolation from the sights and sounds of man would continue to be moderately high.

Based on Atlantic's mitigation measures discussed throughout sections 2.3, 4.8.1, and 4.8.9.1, and implementation of its various construction, restoration, and operation plans, ACP would not conflict with the continued function of the ROS classifications crossed.

Demand Species

Demand species on NFS lands are animal species commonly associated with recreation (e.g., hunting, fishing, viewing, trapping). These species are one aspect associated with MIS, whose needs are used to set management objectives and minimum management requirements to help fulfill the FS' planning objective to provide for a diversity of plant and animal communities consistent with overall multiple-use objectives species.

Black bear, white-tailed deer, wild turkey, and brook trout are identified as demand species on the MNF (FS, 2006). MIS are discussed in section 4.7.3.2 and table R-3 of appendix R; the discussion below focuses on project impacts on recreational activities associated with demand species.

Recreationists such as hunters, fishers, trappers, wildlife viewers of demand species would experience primarily temporary impacts. As also discussed in section 4.8.5, hunters, fishers, and trappers of these species may not be able to access certain tracts of land, depending on where construction is occurring at any given time. Also, wildlife would likely be displaced to avoid construction, affecting the ability to view these species. Based on the current construction schedule presented in section 2.4, this impact would last two hunting and fishing seasons. These impacts would not be significant because the areas outside of the construction workspace would remain available for hunting, fishing, trapping, and wildlife viewing. Operation of ACP and SHP would not interfere with activities associated with demand species as access to these areas disturbed by construction would be restored. Some change in species diversity may occur as a result of the conversion of forested land to open land within the permanent right-of-way.

Based on Atlantic's mitigation measures discussed throughout sections 2.3, 4.4, 4.5, 4.6, 4.7, 4.8.1, and 4.8.1.1, implementation of its various construction, restoration, and operation plans, impacts on demand species would be minimized; however, due to pending survey results, pending conservation measures, and ongoing consultations with the MNF, GWNF, and other appropriate federal and state agencies detailed throughout this EIS, our determination regarding the overall impacts on FS-managed species is pending.

Inventoried Roadless Areas and Wilderness Areas (Recommended and Designated)

Wilderness refers to any area of public land that has been designated by Congress as part of the National Wilderness Preservation System that was established in the Wilderness Act. Recommended Wilderness Areas are those areas that the FS recommends to Congress as candidates for designation as Wilderness. Inventoried Roadless Areas refer to those areas identified and mapped in accordance with the

Roadless Area Conservation Final Rule, also referred to as the 2001 Roadless Rule (FS, 2016i). The 2001 Roadless Rule establishes prohibitions on road construction, road reconstruction, and timber harvesting in Inventoried Roadless Areas on NFS lands (FS, 2016j). The definition of a "roadless area" includes undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for Wilderness consideration under the Wilderness Act of 1964 and that were inventoried by the FS (FS, 2016i).

Based on a review of the MNF LRMP, the above criteria, and consultations with the MNF, ACP would not cross or be within 0.25 mile of lands in the MNF designated by the FS as Inventoried Roadless Areas or Recommended or Designated Wilderness areas.

George Washington National Forest

ACP would cross 16.0 miles of the GWNF (see table 4.8.9-1). The GWNF extends for about 140 miles along the Appalachian and Blue Ridge Mountains in Virginia and West Virginia. The GWNF owns over 1 million acres of land, with approximately 960,000 acres in Virginia and 106,000 acres in West Virginia. Approximately 10.5 million people live in the counties that are within 75 miles of the national forest (FS, 2014). Recreational opportunities offered by the GWNF are similar to those associated with the MNF, and the forest offers many designated and developed recreational sites. About 80 percent of public hunting land in Virginia is located on the GWNF and nearby Jefferson National Forest, and about 75 percent of all hunters in Virginia hunt on the two National Forests (FS, 2016k).

Recreation Opportunity Spectrum

ROS is defined above in the MNF discussion. Similar to the MNF, there are no P, SPNM, or R crossed by the project and, therefore, they are not discussed. Table 4.8.9-9 lists the designated SPM and RN areas affected by the project as described by the GWNF LRMP (FS, 2014). Impacts on ROS areas on the GWNF would be similar to that described above for the MNF.

Demand Species

A discussion of demand species on NFS lands is provided in the subsection above under MNF. The following species are identified as demand species for the GWNF (FS, 2014):

- white-tailed deer;
- eastern wild turkey;
- ruffed grouse;
- gray squirrel;
- cottontail rabbit;
- black bear;
- northern bob-white;
- American woodcock; and
- wild brook trout.

Impacts on demand species on the GWNF would be similar to that described for the MNF. In addition, proposed access roads would cross several waterbodies that support wild brook trout. Sections 4.6.5 and 4.7.3, and appendix R discuss project-related impacts on wildlife brook trout and MIS.

TABLE 4.8.9-9

Recreation Opportunity Spectrum Areas on the George Washington National Forest Crossed by the Atlantic Coast Pipeline [a]

Recreation Opportunity Spectrum Area	Begin Milepost	End Milepost	Miles Crossed [b]	Impacts (acres)	
				Construction	Operation
Roaded Natural	83.9	85.6	2.7	43.6	17.3
Roaded Natural	86.1	86.9	1.3	22.2	10.1
Roaded Natural	93.7	94.3	0.8	12.2	4.5
Roaded Natural	96.1	96.3	0.4	10.6	7.4
Roaded Natural	96.5	96.6	0.2	2.4	1.1
Semi-primitive Motorized	96.8	97.2	0.7	9.7	3.9
Roaded Natural	98.3	99.0	1.3	19.9	8.0
Roaded Natural	99.3	99.6	0.5	9.8	5.1
Roaded Natural	105.9	106.1	0.2	2.7	1.3
Roaded Natural	113.0	113.1	0.1	1.1	0.6
Roaded Natural	113.2	113.2	<0.1	0.1	0.1
Roaded Natural	115.8	116.2	0.4	5.8	2.1
Roaded Natural	116.4	116.5	0.1	1.0	0.4
Roaded Natural	116.8	117.4	0.7	17.2	10.2
Semi-primitive Motorized	117.4	118.8	1.4	23.2	11.3
Roaded Natural	118.8	120.6	1.7	28.5	12.0
Roaded Natural	121.1	123.2	2.1	39.0	14.2
Roaded Natural	154.0	155.1	1.2	24.0	6.9
Roaded Natural	158.0	158.1	0.1	0.0 [c]	0.0 [c]
Project Total			16.0	273.0	116.6

a Features crossed are along the AP-1 mainline. Includes construction and operational pipeline right-of-way and ATWS.

b Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost. However, the project total miles crossed represent the actual distance.

c Crossing is associated with the ANST, which would be crossed using the HDD method, avoiding direct surface impacts.

Source: FS, 2011; FS, 2014

Based on Atlantic's mitigation measures discussed throughout sections 2.3, 4.4, 4.5, 4.6, 4.7, 4.8.1, and 4.8.1.1, implementation of its various construction, restoration, and operation plans, impacts on demand species would be minimized; however, due to pending survey results, pending conservation measures, and ongoing consultations with the MNF, GWNF, and other appropriate federal and state agencies detailed throughout this EIS, our determination regarding the overall impacts on FS-managed species is pending.

Recreation and Special Interest Areas

Several recreational trails and FS roads used to access recreational activities would be crossed by ACP within the GWNF, as listed in table 4.8.9-10. The ANST crossing is discussed separately below. In addition, many types of dispersed recreation activities occur throughout the general forest area on NFS lands. Forest roads and trails provide important access for these activities, even when road or trail use is not a primary recreation pursuit of the user.

Trails within the GWNF are generally non-motorized and multiple use, and most are available to activities such as hunting, hiking, camping, horseback riding, and bicycling. Trails and roads on the GWNF provide access to various viewsheds, campgrounds, picnic shelters, waterbodies, and general forest areas. Forest road public activities include driving in motor vehicles, and hiking, horseback riding, and bicycling. Forest roads also provide administrative access for management activities and emergency response.

TABLE 4.8.9-10

Special Interest Areas Crossed within the George Washington National Forest by the Atlantic Coast Pipeline [a]

County, Commonwealth	Begin Milepost	End Milepost	Crossing Length (miles) [b]	Feature Name	Ownership/ Jurisdiction	Crossing Method	Area Affected (acres)	
							Con.	Op.
Bath, VA	96.5	96.6	0.2	Fort Lewis Trail (Decommissioned)	Private/FS	Conventional	3.0	1.8
Bath, VA	98.7	98.7	<0.1	Shenandoah Mountain Trail (FS Trail 447)	FS	Conventional	<0.1	<0.1
Bath, VA	99.5	99.5	<0.1	Great Eastern Trail (proposed) [c]	FS	Conventional	<0.1	<0.1
Bath, VA	105.9	105.9	<0.1	Brushy Ridge Trail (FS Trail 718)	FS	Conventional	<0.1	<0.1
Augusta, VA	116.5	116.5	<0.1	FS Road 348.1	FS	Bore	<0.1	<0.1
Augusta, VA	116.7	116.7	<0.1	Braley Pond Road/FS Road 715	FS	Bore	<0.1	<0.1
Augusta, VA	117.0	117.0	<0.1	FS Road 449	FS	Conventional	<0.1	<0.1
Augusta, VA	117.1	117.1	<0.1	Dowell's Draft Trail (FS Trail 650) [d]	FS	Conventional	<0.1	<0.1
Augusta, VA	118.7	118.7	<0.1	FS Road 449A	FS	Conventional	<0.1	<0.1
Augusta, VA	118.7	118.9	0.2	FS Road 449B	FS	Conventional	3.0	1.8
Augusta, VA	119.1	119.8	0.7	FS Road 449B	FS	Conventional	10.6	6.4
Augusta, VA	120.2	120.2	<0.1	FS Road 466A	FS	Conventional	<0.1	<0.1
Augusta, VA	120.4	120.4	<0.1	FS Road 466/ White Oak Draft Trail (FS Trail 486) [d]	FS	Conventional	<0.1	<0.1
Augusta, VA	121.0	121.0	<0.1	FS Road 728	FS	Conventional	<0.1	<0.1
Augusta, VA	121.2	121.2	<0.1	FS Road 1755	FS	Conventional	<0.1	<0.1
Augusta, VA	121.4	122.4	1.0	FS Road 1755	FS	Conventional	15.2	9.1
Augusta, VA	121.8	122.0	0.2	FS Road 1757	FS	Conventional	3.0	1.8
Augusta, VA	158.1	158.1	<0.1	ANST (FS Trail 1)	FS	HDD	<0.1	<0.1

[a] Features crossed are along the AP-1 mainline. Includes construction and operational pipeline right-of-way and ATWS.

[b] Due to a route alternative adopted in April 2016, mileposts were adjusted such that the distance between them may not be 5,280 feet. As such, distances crossed cannot always be calculated by subtracting the end milepost from the begin milepost. However, the project total miles crossed represent the actual distance.

[c] Based on comments received on the draft EIS from the VDCR, ACP would cross the proposed Great Eastern Trail (VDCR, 2017a). This portion of the trail is still in the preliminary proposal stage and has been associated with the Shenandoah Mountain Trail crossing as well. As such, the crossing location of the proposed trail relative to the ACP is approximate.

[d] Portions of FS Trail 650 are coincident with portions of FS Road 449. Portions of FS Trail 486 are coincident with FS Road 466. These are managed by the FS as Shared System Routes as both forest roads and forest trails.

As discussed in section 4.8.5, project-related impacts, including restoration of the area following construction would be minimized by implementing Atlantic's and DETI's *Restoration and Rehabilitation Plan*, draft *COM Plan*, *SPCC Plan*, *HDD Plan*, *Timber Removal Plan*, *Invasive Plant Species Management Plan*, *Fire Plan*, and *Fugitive Dust Control and Mitigation Plan*. Following construction, disturbed areas would be restored to their preconstruction conditions. However, routine vegetation maintenance of forest within the permanent right-of-way would be required during pipeline operations. As a result, the project would result in the conversion of forest to open land within the permanent right-of-way, which would be visible to passersby where the right-of-way intersects the trail or road and in the middleground and background from surrounding areas including roads, trails, residences, and general forest areas. Recreational uses of the trails would be allowed to continue.

The impacts on the users' experiences can differ significantly between motorized and non-motorized activities. Non-motorized users travel at a much slower rate so would be exposed to the altered setting longer, and most non-motorized visitors on trails are engaging in their actual recreational pursuit so the effect on their experience would typically be greater. Motorized users on roads are traveling at a faster rate and, therefore, are typically exposed to the changed setting for a shorter duration. There are no motorized trails within the proposed project area on the GWNF. All the trails that would be crossed by, or are near ACP allow non-motorized recreation only, specifically hiking, mountain bicycling, and horseback riding. There are state and FS roads crossed by and within the vicinity of the GWNF that are open to motorized use.

As discussed in more detail below, Atlantic would cross the ANST/FS Trail 1 using the HDD method. Atlantic would cross FS Road 348.1 at AP-1 MP 116.5 and Braley Pond Road/FS Road 715 at AP-1 MP 116.7 using the bore method, which would avoid direct impacts as discussed in section 2.3.3.2. Travelers would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with ATWS for bore activities. Atlantic would cross the remaining trails and roads on the GWNF (including the Great Eastern Trail (proposed), Shenandoah Mountain Trail/FS Trail 447, Brushy Ridge Trail/FS Trail 718, Dowell's Draft Trail/FS Trail 650, and White Oak Draft Trail/FS Trail 486) using the conventional construction method, which is described in section 2.3.2. As a result, these crossings would require temporary trail and road closures, which would impact recreational and FS users' experience of these trails and roads. Section 4.8.9.1, Recreation and Special Interest Areas, lists the measures Atlantic would implement as part of its *Public Access Plan* (part of the *COM Plan*, see appendix G).

In response to our recommendation in the draft EIS, Atlantic investigated using the bore or HDD method to cross all trails and roads on the GWNF. Atlantic would use the open-cut method at 4 trail and 15 unpaved road crossings. Atlantic states that use of the HDD method is not technically feasible due to the mountainous terrain at these locations. More specifically, an HDD requires a minimum 2,400-foot-long distance between the HDD entry and exit points, and requires equivalent elevations at the HDD entry and exit points. Atlantic also states that use of the bore method is not technically feasible where a road is cut into a slope or located in steep terrain. Because the bore method requires ATWS to accommodate excess spoil from excavations of the bore pits, the areas must be large enough to accommodate the boring equipment, provide access for workers and equipment, and allow workers to enter the trench to tie the crossing sections into the mainline. These HDD and bore method criteria are not available along the proposed route in the GWNF. In contrast, the open-cut method is technically feasible in all locations, would disturb less land than the combined ATWS associated with an HDD or bore crossing, and would typically be completed in a day or less.

Given the above information from Atlantic, table 4.8.9-10 reflects that the conventional (open-cut) method would be used at trails and roads crossed on the GWNF. However, we note that based on information subsequently provided by Atlantic for revised appendix M, which lists all road and railroad crossings along the projects, trails and roads on the GWNF would be crossed using the bore method. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary a revised trail, road, and railroad crossing table that lists the final crossing method that it would implement at each trail, road, and railroad. The crossing method at trails and roads on the GWNF should be developed in consultation with GWNF staff.**

Regardless of the crossing method, Atlantic committed to keeping FS trails and roads open to foot or vehicular traffic during most of construction, except during brief periods when it would be necessary to close the road or trail to install the pipeline. An unexcavated area where the trail or road crosses the right-of-way would remain untrenched and open until the pipeline crossing section (about 40 feet long) is ready to be installed, which would be after the pipeline is installed on either side of the road or trail. In addition, construction traffic would need to enter, exit, and/or cross these roads or trails where they intersect the right-of-way, which would result in minor and infrequent traffic disruptions.

Most road or trail crossings would be completed in less than a day, and recreationalists would be prevented from using the trail or road crossing during this time. As such, Atlantic committed to continue consultations with the GWNF to develop trail or road crossing plans. These plans have not yet been completed. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should, if a bore or HDD crossing is not feasible, file with the Secretary, for review and written approval by the Director of OEP, site-specific crossing plans that identify the location(s) of a detour, public notification, signage, and consideration of avoiding days of peak usage for each trail and road affected by ACP on the GWNF. The crossing plans should be developed in consultation with GWNF staff.**

Based on Atlantic's mitigation measures discussed throughout sections 2.3, 4.4, 4.5, 4.6, 4.7, 4.8.1, and 4.8.1.1, implementation of its various construction, restoration, and operation plans, and our recommendations, impacts on special interest areas on the GWNF would be minimized to the extent practicable and would not be significant or adverse.

Appalachian National Scenic Trail

The AP-1 mainline would cross the ANST (FS Trail 1) at AP-1 MP 158.1 where it is located on NFS land associated with the GWNF. The ANST is a continuous, over 2,190-mile-long footpath that runs from central Maine to northern Georgia, traversing 14 states and the Appalachian Mountain chain (NPS, 2008; NPS, 2016g). The trail is the longest hiking-only footpath in the world, crossing lands administered by 8 National Forests, 6 National Parks, and 1 NWR, and over 60 state game lands, forest, or park areas (NPS, 2008). The trail was conceived in 1921 and first completed in 1937, primarily by citizen volunteers, and volunteers from local trail clubs perform most of the maintenance on the ANST today. The ANST became the nation's first national scenic trail with the signing of the National Trails System Act (Public Law 90-543; 16 U.S.C. 1241-1251) in 1968. The trail offers backcountry recreation and hiking opportunities and protects natural and cultural resources within its corridor. Over 2.5 million people visit some portion of the trail every year (NPS, 2016h).

Under the authority of the National Trails System Act (1968) and its amendments (1978), the Secretary of the Interior (represented by the NPS) has been given responsibility for administration of the entire ANST in consultation with the Secretary of Agriculture (represented by the FS) (NPS, 1981). The

Secretary of Interior may delegate to states or private organizations or individuals the responsibility to operate, develop, or maintain portions of the ANST. Overall cooperative trail management is conducted by the ATC, 31 ATC-affiliated Local ANST Clubs, FS, and the NPS' Appalachian Trail Park Office along with other organizations, trail clubs, agencies, and cooperators (NPS, 2008; NPS, 2016g; ATC, 2016).

Stewardship, management, development, administration, and use of the ANST are guided by several documents, including but not limited to the following:

- Comprehensive Plan for the Protection, Management, Development and Use of the Appalachian National Scenic Trail (NPS, 1981; abridged version 1987);
- Appalachian Trail Statement of Significance (2000);
- Appalachian Trail Design, Construction, and Maintenance (Stewardship Manual) (Birchard and Proudman, 2000);
- Appalachian Trail Resource Management Plan (NPS, 2008);
- ATC's Local Management Planning Guide (ATC, 2009);
- ATC Strategic Plan (ATC, 2014);
- ATC Policy on Pipeline Crossings of the Appalachian Trail (ATC, 2015); and
- LRMPs on NFS lands.

ATC's policy is to oppose pipeline crossings of ANST corridor lands, conservation easements that it manages, or adjacent lands that could have an adverse impact on ANST resources, unless they meet certain criteria, which are summarized as follows (ATC, 2015):

1. The proposed pipeline is demonstrated to be the only prudent and feasible alternative to meet an overriding public need.
2. The proposed pipeline crosses the ANST landscape at a point already subject to significant impact, such as an existing pipeline, road, or power-line crossing.
3. The pipeline proposal includes use of best practices to minimize its impact on the ANST (e.g., using construction techniques that minimize disturbance to ANST landscapes such as the HDD method; eliminating or minimizing the width of cleared area for the pipeline; narrowing the cleared area after installation; minimizing landscape fragmentation).
4. The proposed pipeline does not cross an area unsuitable for such development (e.g., Wilderness Areas and wilderness study areas, National Recreation Areas, National Natural Landmarks, Wild and Scenic Rivers, cultural resource sites, old growth forests, rare species habitat).
5. Pipeline authorizations include mitigation for any loss of the natural, cultural, scenic, and recreational values of the ANST.
6. Pipeline authorizations include using best practices to reduce the impacts of maintenance on the aesthetic values of the ANST.

7. Pipeline authorizations clearly acknowledge the pipeline owner and operator's affirmative duty to protect the environment and ensure the health and safety of ANST users and the communities near the trail.

8. All pipeline authorizations include best practices for minimizing methane emission that can contribute to climate change.

Atlantic would cross the ANST (along with the BRP) using the HDD method. The current location of the ANST in this area has been determined to also be the optimal permanent location for this trail. While some minor hand cutting of brush to lay a guide wire for an HDD may typically be required between the HDD entry and HDD exit points, Atlantic would use a gyroscopic guidance system at the ANST and BRP crossing that does not require a guide wire or associated brush clearing. The HDD entry and exit points would be located about 1,400 feet and 3,400 feet, respectively, away from the ANST footpath, on private lands. A temporarily closure or detour around the construction area for ANST recreationalists would not be needed, nor would the removal of vegetation and trees between the HDD entry and exit points. HDD activities at the entry and exit points would last about 12 to 14 months and would likely be heard by users of the ANST. The increase above the ambient sound level at two noise sensitive areas (NSAs) located 600 feet and 1,300 feet from the HDD entry site would be about 0.1 to 0.2 decibels. Section 4.11.2.2 provide additional discussion of noise impacts associated with the HDD method at this location. During construction, activities and their associated noise would be ongoing continuously for 24 hours per day. Lights used for construction at night would interfere with and diminish the ability to engage in star gazing and viewing astronomical events such as meteor showers. These impacts would be temporary. There would be no vegetation manipulation or surface ground disturbance on either FS or NPS lands adjacent to the ANST or within the defined ANST Corridor during either the construction or operation of this proposal. There would be no significant long-term or permanent loss of the natural, cultural, scenic, and recreational values of the ANST within the Rx 4A area. A site-specific crossing plan for the ANST is included in appendix H.

The proposed pipeline crossing of the ANST is on lands acquired and administered by the NFS on the GWNF and subject to both Forestwide and Rx 4A Standards and Guidelines. Rx 4A consists of those lands mapped as the foreground area visible from the ANST footpath and as designated on a case-by-case basis (FS, 2014). This prescription area also includes all NFS lands acquired by the NPS for the ANST and administratively transferred to the FS by the NPS under a MOA (FS, 2014). Specific to linear utilities and rights-of-way, GWNF Standard 4A-025, Lands and Special Uses, directs: "Locate new public utilities and rights-of-way in areas of this Rx area where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the prescription area, per project" (FS, 2014).

We analyzed an alternative crossing method at the ANST and BRP in section 3.3.4.3 in the event the HDD method is unsuccessful. The crossing method, referred to as the direct pipe, would still avoid direct surface impacts on the ANST and BRP, although the ATWS associated with the crossing would be closer to the trail and parkway. Regardless, there would be no significant long-term or permanent loss of the natural, cultural, scenic, and recreational values of the ANST should the alternative direct pipe crossing method be adopted. As with the HDD crossing, if the Direct Pipe Second Contingency Option (as discussed in section 3.3.4.3) is utilized, there would be no vegetative manipulation or surface ground disturbance on either FS or NPS lands adjacent to the ANST or within the defined ANST Corridor during either the construction or operation of this proposal.

We reviewed Atlantic's site-specific HDD crossing plan and alternative direct pipe crossing plan for the ANST and BRP and find it acceptable. Also, in a letter dated April 4, 2017, the FS stated it believes the HDD would be feasible as proposed by Atlantic and the direct pipe option would be a feasible contingency option, and that it has no further questions or requests for information regarding the crossing methods. However, comments from the NPS have not yet been received. Therefore, **we recommend that:**

- **<u>As part of its Implementation Plan (recommended Environmental Condition No. 6)</u>, Atlantic should file with the Secretary, for review and written approval by the Director of OEP, a final site-specific HDD crossing plan and an alternative direct pipe crossing plan for the BRP. Provide documentation that Atlantic has consulted with the NPS regarding both of these plans and adopted or addressed any substantive comments from the NPS into these plans.**

Inventoried Roadless Areas and Wilderness Areas (Potential, Recommended, and Designated)

Based on a review of the GWNF LRMP, the criteria described above, and consultations with the GWNF, Atlantic's proposed AP-1 mainline would not cross lands designated by the FS as Inventoried Roadless Areas, Potential Wilderness Areas, Recommended Wilderness Areas, or Wilderness. For the GWNF, areas called Potential Wilderness Areas (PWAs) were identified during the LRMP revision process. These were areas identified that met certain inventory characteristics of wilderness and were then evaluated during the plan revision to determine which areas might be recommended for wilderness study in the revised LRMP. The GWNF LRMP states that activities proposed within these PWAs should be evaluated for their effects on the wilderness characteristics. Atlantic does not propose any activities within any Inventoried Roadless Areas, designated Wilderness, Recommended Wilderness Study Areas, or PWAs on the GWNF.

Visual Resources

The responsibility for protecting visual resources on federal lands was established by the Federal Land Policy and Management Act, which places emphasis on the protection of scenic resources on public land, and the Forestland and Rangeland Renewable Resources Planning Act, which empowers the FS to manage scenery resources. The MNF LRMP and GWNF LRMP guide natural resource management activities on lands administered by the MNF and GWNF. Visual resources on NFS lands are assessed using the Scenery Management System (SMS).

The existing condition of the MNF and GWNF along the proposed ACP is mountainous terrain predominantly forested with mixed hardwoods. At the large physiographic scale (viewed aerially or in the background distance), the landscape is characterized by series of long, roughly parallel ridges with stream and river valleys separating them. There are individual peaks and knobs along these linear ridges, and deep drainages create numerous smaller side ridges, typically perpendicular to the main ridge at the top and then often curving as they descend, converging in the stream valleys. These landforms steepen in places and level out in others offering scenery comprised of complex and interesting shapes and forms. On the MNF and GWNF, these landforms are predominantly covered in forests.

When viewed at a closer distance, rock outcrops and boulders, water features, and mixed vegetation provide textures, patterns, and seasonally changing colors. Water also offers sound, movement, and reflections.

Most of this landscape on and adjacent to NFS lands along the ACP pipeline route is natural appearing. However, there is evidence of human alterations such as gravel and native surface FS roads, native surface trails, and existing utility rights-of-way, primarily overhead transmission lines and underground gas transmission lines. There is a patchwork of ownership including the NFS lands, Virginia DOT road rights-of way, and private lands. The boundaries between land ownership are not always evident to the public. Some private lands viewed from FS roads, trails, and general forest area include land uses that are not natural appearing such as roads, utility corridors, residences, agricultural lands (pastures, farms), and commercial businesses. These altered settings are primarily located at the lower elevations in the stream valleys and lower toe-slopes. The higher elevations, including mountain ridges and peaks, are predominantly natural appearing on NFS and private lands.

Changes in the scenery of the National Forest may be noticeable when viewed from travelways (roads, trails, rivers, railroads), observation points, residential areas, and population centers. The FS developed the SMS for inventorying and classifying scenery, and establishing standards called SIOs.

Forest Service Scenery Management System

The MNF and GWNF are currently using the FS SMS to manage scenery resources on forest lands. The goal of SMS is to "create and maintain landscapes having high scenic diversity, harmony, and unity for the benefit of society in general" (FS, 1995). This system integrates aesthetics with biological, physical, and social/cultural resources when considering forest scenery during forest planning and project design (FS, 2011). The SMS is used to evaluate the existing scenic condition of the landscape and to evaluate potential scenic impacts from proposed projects. One of the first objectives within the SMS is to develop the landscape character descriptions. The landscape character is defined as the visual and cultural image based on the physical, biological, and cultural attributes that make each landscape unique or identifiable (FS, 1995). The SMS acknowledges scenery management is an integrated part of the ecosystem.

The proposed alignment for the ACP would cross several Rx areas on the MNF and GWNF (see table 4.8.9-6). The SMS provides that data gathered and mapped for scenic attractiveness, landscape distance and visibility, and relative importance of scenery to the public is used to assign a numerical scenic class rating (1-7). Scenic classes are assigned to all lands associated with each management prescription. Mapped scenic classes are used during forest planning to compare the relative value of scenery with other resources, such as timber, wildlife, old growth, or minerals. Scenic integrity levels are assigned to each scenic class through the forest planning process. Generally, scenic classes 1-2 have high public value, classes 3-5 have moderate value, and scenic classes 6-7 have low value.

Scenic integrity is the degree of intactness or wholeness of the landscape character, or conversely the state of disturbance created by human activities. Integrity is stated in degrees of deviation from the existing landscape character and are defined as very high to very low (FS, 1995). SIOs express the desired and preferred future scenery conditions for the forest, and there are standards in the GWNF LRMP to determine the degree of deviation or visual contrast that may occur as a result of specific activities. SIOs are defined in the SMS Handbook (FS, 1995) as follows:

- Very High – Landscapes where the valued landscape character appears intact with only minute if any deviations.
- High – Landscapes where the valued landscape character appears intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.
- Moderate – Landscapes where the valued landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- Low – Landscapes where the valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed. They should not

only appear as valued character outside the landscape being viewed but compatible or complementary to the character within.

- Very Low – Landscapes where the valued landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character. Deviations must be shaped and blended with the natural terrain so that the unnatural elements do not dominate the composition.

SIOs have been determined for the GWNF but have not been established for the MNF. Instead, scenic classes have been established for the MNF. For the purposes of this EIS, scenic classes are the best way to describe the existing scenic resources within the MNF and can be used as an acceptable proxy for determining SIOs within the MNF.

Distance zones reflect the typical distance in which the landscape is commonly viewed from travelways, observation sites, and use areas where the users are known to have a concern for the national forest scenery being viewed. These distance zones are used in defining scenic classes, assessing the degree to which details of the viewed project would affect visual resources, and determining whether the SIOs (GWNF) and Scenic Classes (MNF) can be achieved. The following distance zones are used to inventory and classify landscape visibility:

- Immediate Foreground: 0 to 300 feet
- Foreground: 300 feet to 0.5 mile
- Middleground: 0.5 mile to 4 miles
- Background: 4 miles to horizon

The “foreground” area, identified as occurring from 0 to 0.5 mile from the project, is the location from which project element details would be visually clear. In the immediate foreground, people can distinguish individual leaves, flowers, twigs, bark texture, and can notice movement of leaves and grasses in light winds. In the foreground distance from 300 feet to 0.5 mile, people can distinguish small boughs of leaf clusters, tree trunks, and large branches, individual shrubs, clumps of wildflowers, and can distinguish movement of tree boughs and treetops in moderate winds. Texture is largely made up of boughs, branches, and visible portions of trunks. Individual forms are dominant. In the “middleground,” classified as the area from 0.5 to 4 miles from the project, viewers can distinguish individual tree forms, large boulders, flower fields, small openings in the forest, and small rock outcrops. Tree forms typically stand out vividly in silhouetted situations. Form, texture, and color remain dominant, and pattern is important. A middleground landscape having steep topography is often the most critical of all distance zones for scenery management. At a background distance, from 4 miles to the horizon, people can distinguish groves or stands of trees, large openings in the forest, and large rock outcrops. Texture and color diminish with distance; large patterns of vegetation or rock are still distinguishable and landform ridgelines and horizon lines are the dominant visual characteristic.

The FS requested that Atlantic prepare a landscape scale analysis of areas potentially visible within 5 miles from the centerline of the proposed route on the National Forest. This radius includes the foreground, middleground, and a portion of the background distance zones defined in the SMS. The analysis generated bare earth viewshed maps to identify all potentially visible areas and develop KOPs. A KOP can represent a point from which ACP would be visible but can also represent lengths of travelways such as segments of roads, trails, and the ANST. Additional KOPs were added as recommended by the FS, public comments, and the ATC. The bare earth “seen area” analysis was conducted twice: once in October 2015 and again in March 2016 due to a major ACP reroute. The reroute resulted in several original KOPs being dropped and new KOPs being added.

Atlantic, in consultation with the FS, selected KOPs on or near NFS lands that include specific viewing locations associated with concern level 1 and 2 roads and trails, including the ANST and the BRP as well as Wild Oak National Recreation Trail, Shenandoah Mountain Trail, and many other trails and known observation sites, where the "seen area" analysis indicated potential visibility of the project on NFS lands. Atlantic then used these KOPs to conduct on-site assessments of potential views to the pipeline corridor, inventory existing landscape character and uses, identify lack or presence of intervening topography and vegetative screening, and prepare visual simulations from photographs. As described in more detail below, a draft VIA as prepared for the project. The draft VIA also considered other factors such as distance viewed, duration of view, angle of view, and aspect of the project in relation to the KOP to determine whether the project would be compatible with Scenic Classes on the MNF and achieve the Forest Plan SIOs on the GWNF.

The VIA (see appendix T) has not been finalized as of the issuance of this final EIS. Once the VIA is completed, the FS would work with Atlantic to incorporate any mitigation measures that may be needed to ensure consistency with LRMP SIO's into the *COM Plan* or SUP.

Key Observation Points

Atlantic completed a draft VIA on January 20, 2017, and the FS submitted comments on April 6, 2017. A subsequent version of the draft VIA that addressed the FS' comments was provided to the FS on June 6, 2017, and the FERC on the June 12, 2017; the VIA has not been finalized. The draft VIA evaluates and characterizes the existing condition and assesses the level of visual alteration or visual contrast that would be introduced by the AP-1 Mainline route across the MNF and GWNF. Atlantic, in consultation with the FS, identified KOPs within the viewshed, which extend 5 miles from the proposed pipeline centerline. KOPs were located on travel routes and trails, designated recreation areas, and waterbodies from which the pipeline and facilities on NFS lands could be visible to the public. Atlantic's field surveys were conducted in October and November 2015 and February, October, and November 2016. As a result of additional analysis and discussions with the FS, several KOPs were removed from further evaluation due to the absence of actual views of the pipeline corridor. The refined list of KOPs within the MNF were evaluated using field surveys, and it was determined that there were no views of ACP from any of the identified KOPs; therefore, further analysis of KOPs within the MNF were not required.

To show how the views of the pipeline right-of-way would change over time, Atlantic prepared a series of photo simulations for each KOP within the GWNF. The series of simulations provided in the draft VIA show potential views of ACP after construction from select KOPs after one growing season, after 5 years, and after 15 to 20 years. The KOP field photographs and full simulations should be provided in the final VIA (see appendix T). The individual KOPs are described below as provided in the draft VIA and with incorporation of the Mitigation Measures for Scenery also provided below.

Potential Impacts on Scenery

For all MNF and GWNF project locations (except where the ACP would bore under the ANST, roads, and creeks), trees would be cleared along the pipeline right-of-way for a 125-foot width during construction. This conversion from forested landscape to a cleared work zone would create contrasts in the scenery by changing the texture and color, introducing lines, and changing forms. The edges of the corridor would form parallel lines not typically found in natural appearing landscapes. The construction right-of-way would not repeat or mimic the natural attributes currently found in the landscape character of the national forest.

Where visible in foreground and middleground distance zones (up to 4 miles) and where the project would cross moderate to steep slopes, the project would either dominate or begin to dominate the characteristic landscape depending on the angle and aspect of view, distance viewed, the relative size of the project within the overall viewshed from the viewer's location, and the duration of view (in a moving car, hiking, stopping at an overlook). Where visible in the background distance zone, depending on factors similar to those listed above, the project could begin to dominate the characteristic landscape, particularly in fall, winter, and spring seasons when air quality is typically clear, and when the corridor becomes covered in frost or snow. After construction is completed, topography would be restored to its previous contours to the extent feasible. ATWS would be restored and revegetated as well as revegetation of the construction right-of-way.

Without mitigation, the permanently maintained right-of-way would not repeat or mimic the natural attributes currently found in the landscape character of the national forest. The edges of the maintained corridor, though narrower than the construction corridor, would continue to form nearly parallel lines which are not natural appearing (geometric shapes are avoided as a standard mitigation). These parallel corridor edges would primarily consist of trees while the corridor would be herbaceous groundcover. These vertical edges would introduce shadow lines which further accentuate and draw the viewers' attention to the corridor. The color and texture of the herbaceous groundcover, typically lighter green during growing season and yellowing or brown in dormant season, would contrast with the deeper green color and texture of the adjacent mixed hardwood forest in the growing season; and in winter, snow would be obvious within the corridor before it covers the adjacent trees. The texture of herbaceous cover would appear smooth while the adjacent intact forest canopy texture would be moderate to course, depending upon the species composition and distance from the viewer. Where the pipeline would cross the tops of the forested ridges, it would create a square notch in the otherwise intact ridgeline. Major forms, particularly mountains, draw viewers' attention normally, and a notch in the otherwise intact ridgeline is a noticeable deviation to form. These contrasts and changes in line, color, texture, and form can attract the casual observer's attention if the line of sight between the observer and the altered landscape is not blocked or screened by intervening topography, vegetation, buildings, or other features.

Mitigation Measures for Scenery

Minimizing visual effects is critical for reducing duration of impacts of the construction right-of-way and the long-term impacts of the operational right-of-way. Therefore, per conversations between FERC and the FS, the operational right-of-way width would be maintained consistent with FERC *Plan* and *Procedures* for the length of the entire right-of-way on the NFS lands. More specifically, the FS would require the company to reduce its mowing to a 10-foot-wide strip centered over the pipeline, and reduce its trimming or selective cutting of trees to a 30-foot-wide strip centered over pipeline.

Outside the 10-foot-wide strip, the remainder of the construction and permanent right-of-way would be revegetated using acceptable seed mixes, pollinator plants, shrubs, and trees in accordance with FERC *Plan* and as described in the final *COM Plan*. Particularly along the edge of this herbaceous linear opening, a variety of sizes and species of vegetation would be planted in a manner that breaks up the straight, parallel edges of the corridor and reduces the hard shadow line that can draw the viewer's attention.

Monongahela National Forest

The MNF LRMP (FS, 2011) outlines the general management goals and guidelines for Scenery Management, which is that management activities be consistent the SMS Handbook and ROS. ROS areas crossed by the project include SPM and RN, as listed in table 4.8.9-8. Scenic class areas that are affected and crossed by ACP are listed in tables 4.8.9-11 and 4.8.9-12. No aboveground facilities would be located on the MNF, including compressor stations, M&R stations, pig launchers, pig receivers, and communication towers.

ACP would cross approximately 4.9 miles (68.5 acres) of the MNF in areas designated with a high scenic class (High SIO equivalent) and less than 0.5 mile (11.6 acres) with a moderate scenic class (Moderate SIO equivalent). The construction of temporary access roads would impact approximately 15.4 acres designated as High SIO and 4.7 acres as Moderate SIO. Visual impacts from construction of the ACP right-of-way and access roads would be similar to those described in section 4.8.8. Although additional site-specific visual analysis concluded that there were no views of ACP at the MNF KOPs described below, the removal of vegetation and trees in High SIO areas for the right-of-way, access roads, and ATWS would create visual alterations and contrasts that are visible on the landscape. Atlantic would feather the right-of-way edges in irregular patterns to blend in with the existing landscape in the immediate foreground, foreground, or middleground of visually sensitive areas. As such, views would likely be intermittent and would vary depending on topography, vegetation, and leaf-off or leaf-on conditions.

TABLE 4.8.9-11

Lengths of Scenic Class Areas Crossed by the Atlantic Coast Pipeline on the Monongahela National Forest

Begin Milepost [a]	End Milepost	Miles Crossed	Scenic Class Areas
73.1	73.6	0.8	High
80.5	80.5	<0.1	High
80.5	80.5	<0.1	Medium-High
80.5	80.6	0.2	High
80.6	80.7	0.1	Medium-High
80.7	80.9	0.2	High
81.2	81.3	0.1	High
81.3	81.4	0.1	Medium-High
81.4	81.5	0.2	High
81.5	81.8	0.4	High
81.8	83.2	2.0	High
83.2	83.3	0.2	Medium-High
83.3	83.6	0.5	High
83.6	83.6	<0.1	Medium-High
83.6	83.9	0.4	High

[a] The straight-line distance between consecutive mileposts as indicated or depicted in tables and figures in this filing may be greater than or less than 5,280 feet. The mileposts should be considered as reference points only.

TABLE 4.8.9-12

Scenic Class Areas Affected by the Atlantic Coast Pipeline on the Monongahela National Forest

Scenic Class Area	Pipeline		Access Roads	
	Construction (acres) [a]	Operations (acres)	Construction (acres)	Permanent (acres)
Very High	0.0	0.0	0.4	0.4
High	68.5	26.3	15.4	15.4
Medium-High	11.6	4.6	4.7	4.7
Medium	<0.1	<0.1	0.0	0.0
Medium-Low	0.0	0.0	<0.1	0.0
Low	0.0	0.0	0.0	0.0
Very Low	<0.1	<0.1	0.0	0.0
Total	**80.1**	**30.9**	**20.5**	**20.5**

[a] Construction impacts include operational pipeline right-of-way, temporary construction right-of-way, and ATWS.

George Washington National Forest

All Rx areas within the GWNF contain standards SIOs for managing scenery. The SIOs for the GWNF lands that would be crossed by the ACP mainline are provided in tables 4.8.9-13 and 4.8.9-14. No aboveground facilities would be located on the GWNF, including compressor stations, M&R stations, pig launchers, and pig receivers. As mentioned previously, modifications at two existing communication towers are proposed as part of ACP. However, these sites are currently owned by Dominion and the activities proposed (i.e., adding antennas) would not require new or additional authorization from the NFS.

Project Consistency with Scenic Integrity Objectives

ACP would cross about 15.7 miles (248.3 acres) of the GWNF in areas designated as Moderate SIO and 0.1 mile (1.3 acres) designated as High SIO. The construction of access roads would impact approximately 47.3 acres designated as Moderate SIO and 4.1 acres designated as High SIO.

High SIO – Rx 4A, Scenic Class 1

The AP-1 mainline would cross 0.1 mile of the ANST at MP 158.1 within the GWNF. This portion of the ANST is designated as having a High SIO and is heavily used by long-distance hikers, as well as by day use hikers and section hikers due to its proximity to the Reeds Gap parking lot along the BRP. Atlantic would install the proposed pipeline under the ANST using the HDD method; as such, tree and vegetation removal would not be required between HDD entry and exit points. The HDD entry points would be approximately 1,400 and 3,400 feet away from each side of the trail, and the HDD points and associated ATWS would be hidden by existing mature hardwood trees, vegetation, and topography. This would eliminate the potential visual impacts for those traveling on the ANST at the point of ACP crossing and would meet a High SIO.

In addition, Atlantic conducted visual analyses and prepared photo simulations to determine and report on the potential visual effects that the proposed ACP could have on the ANST and Seneca State Forest in response to comments from the ATC and NPS. The additional analysis included further evaluation of the KOPs presented in Atlantic's Draft VIA and nine additional KOPs along the ANST, and eight new KOPs near the Seneca State Forest as recommended by the ATC and NPS.

In addition, on the GWNF a portion of proposed access road 07-001.AR1-AR9 would cross Rx 7B – Scenic Corridors and Viewsheds, which is managed for visual resources (see table 4.8.9-7). Improvements and upgrades would be made to existing FS Roads 466 and 466A.

Moderate SIO – Rx 7E2, Scenic Class 2 and Rx 13, Scenic Classes 2, 3, 4, 5

Where visible from travelways and use areas where the public has a concern for visual quality, the construction right-of-way would not be consistent with a Moderate SIO. As described above, the construction right-of-way would introduce contrasts of color, texture, line, pattern, and form that would begin to dominate the landscape theme of natural appearing on the GWNF.

TABLE 4.8.9-13

Lengths of Scenic Integrity Objective Areas Crossed by the Atlantic Coast Pipeline on the George Washington National Forest

Begin Milepost [a]	End Milepost	Miles Crossed	Rx Area	Scenic Classes (west to east)	Scenic Integrity Objective Area
83.9	86.9	4.1	13	3, 5, 2	Moderate
93.7	94.3	0.8	13	3	Moderate
96.1	96.3	0.4	13	3, 4	Moderate
96.5	96.6	0.2	13	3	Moderate
96.8	97.2	0.7	13	3, 5	Moderate
98.3	99.0	1.3	13	5	Moderate
99.3	99.6	0.5	13	5	Moderate
105.9	106.1	0.2	13	2	Moderate
113.0 [b]	113.1	0.1	13	3, 5	Moderate
113.2 [b]	113.2	<0.1	13	5	Moderate
115.7	116.1	0.4	13	5	Moderate
116.3	116.4	0.1	13	2	Moderate
116.6	120.5	3.8	13	2, 5	Moderate
120.9	122.3	1.4	13	2,5	Moderate
122.3	122.6	0.3	13	2	Moderate [c]
122.6	123.2	0.6	13	5, 2	Moderate
154.0	155.1	1.2	7E1	2	Moderate
158.0	158.2	0.1	4A	1	High

[a] The straight-line distance between consecutive mileposts as indicated or depicted in tables and figures in this filing may be greater than or less than 5,280 feet. The mileposts should be considered as reference points only.

[b] Not listed in table 4-2 of the draft VIA.

[c] Atlantic's draft VIA lists this area as High. However, based on a review of the FS GIS data, the crossing is within SIO of Moderate.

TABLE 4.8.9-14

Scenic Integrity Objective Areas Affected by the Atlantic Coast Pipeline on the George Washington National Forest

Scenic Integrity Objective	Pipeline		Access Roads	
	Construction (acres)	Operations (acres)	Construction (acres)	Operations (acres)
High	5.3	2.3	4.0	3.5
Moderate	242.6	92.6	44.4	44.0
Low	0.0	0.0	0.3	0.3
Total	**247.9**	**95.0**	**48.8**	**47.8**

[a] Construction impacts include permanent pipeline right-of-way, temporary construction right-of-way, and ATWS.

The mitigations described above would be effective in substantially reducing the visibility of the long-term right-of-way. The visual contrasts introduced by the project would subside and the natural appearing forest colors, textures, and pattern would be reinstated, though not the same as intact forest canopy. After the right-of-way has been revegetated, there would still be a perceptible change in texture due to the presence of shrubs and small trees rather than large, mature trees; and there would be a contrast of color, texture, pattern, line, and form that would be perpetuated with the permanent 10-foot-wide herbaceous corridor. From most locations, this would be noticeable to the casual observer. Depending on many factors (particularly distance viewed, angle and aspect of view, and duration of view) this may or may not appear to dominate the landscape character and theme.

Assessment of site-specific impacts on scenery viewed from KOPs on and near the GWNF follows.

KOP 34 – Torry Ridge Trail 1

Existing visual conditions at Torry Ridge Trail 1 (FS System Trail [FST] 507) is dense hardwood forests and undergrowth; but includes a rockslide area just below the trail that creates an opening in the forest canopy and allows views of the Blue Ridge Mountains. The AP-1 mainline right-of-way would be visible in the middleground from Torry Ridge Trail 1 at approximate MP 157 at about 1.2 miles. It would be visible on the far side of Back Creek valley as it climbs the mountain toward the west bore location below the ANST and BRP. The visible portion of the AP-1 mainline would not be on the GWNF.

KOP 35 – Torry Ridge Trail 2

Existing visual conditions at Torry Ridge Trail 2 (FST 507) include a mixed hardwood and pine forest, with heavy undergrowth. A partial gap in the forest allows a view of Back Creek valley in the middleground and the Blue Ridge Mountains in the background. The AP-1 mainline right-of-way would be visible in the middleground, about 0.5 mile south of where the pipeline crosses GWNF land in the valley. In the near middleground, the AP-1 mainline construction right-of-way would be evident from the trail and would create a visual contrast from the existing landscape character in terms of color, form, and texture. From locations that have an unobstructed view, these contrasts would dominate the landscape character and would not meet the Moderate SIO. The pipeline would be less visible during leaf-on seasons, and the views would be intermittent and short for recreationists moving along this trail. Visual contrasts and impacts would be less evident after restoration and vegetation becomes established. These mitigations would reduce the extent of contrasts. The operational right-of-way would potentially be noticeable to casual observers, but it would not dominate the landscape character. The operational right-of-way, as mitigated, would meet the Moderate SIO.

KOP 38 – Blue Ridge Parkway at Ravens Roost

Existing landscape character viewed from KOP 38 includes expansive views of dense, mature, mixed oak forest on Torry Ridge which is the prominent feature in the middleground. The valley at the base of Torry Ridge in the near middleground is primarily natural appearing forest but also contains mixed land uses that include roads, residences, and some agricultural patches. The valley viewed from the KOP wraps around the north end of Torry Ridge where it broadens into expansive middleground and background views that include predominantly forested areas with large openings of agricultural and other land uses.

From Raven’s Roost Overlook, ACP between AP-1 MPs 152 and 156 would be visible in the middleground at about 0.75-mile distance to the northwest. About 1 mile of this, between AP-1 MPs 154 and 155, is located on the GWNF with a SIO of Moderate. The contrasts in color, texture, pattern, and line would dominate the characteristic landscape during and following construction. Over the next 5 years, the revegetation described in the mitigations above would significantly reduce the visibility of the right-of-way on GWNF land. The appearance of the long-term ACP right-of-way located in the valley would borrow from the existing landscape character. In particular, the ACP right-of-way would appear similar to the linear, open corridor for Torry Ridge Road (SR 664). The ACP right-of-way on the GWNF would be noticeable to casual observers at the KOP, but it would not dominate the characteristic landscape. This would meet the Moderate SIO.

KOP 40 – Appalachian National Scenic Trail: Bee Mountain near Three Ridges Wilderness

Existing visual conditions at KOP 40 include dense, mature mixed hardwood trees in the foreground and densely forested Piney Mountain and Bryant Mountain in the background. The AP-1 mainline right-of-way would be visible in the middleground from the ANST at Bee Mountain at approximate MP 160, approximately 2.25 miles east-northeast from the KOP. This is not located on the GWNF. The heavily forested Piney Mountain would block views of the right-of-way even in leaf-off conditions and would not impact the valued landscape viewed from this KOP.

Additional KOPs identified near or at the ANST in response to stakeholder and agency comments are discussed in section 4.8.9.2.

KOP 64 – Shenandoah Mountain Trail Crossing Location

Existing visual conditions at the Shenandoah Mountain Trail (FST 447) include dense, hardwood forests that cover Shenandoah Mountain. The AP-1 mainline right-of-way would intersect and follow the trail for about 220 to 225 feet on top of a knob at about AP-1 MP 98.7. This would impact the scenery in immediate foreground and foreground with views in both directions along the right-of-way. Outside of this location, existing trees, vegetation, and topography would block views to the remainder of the corridor. This area is designated as having a Moderate SIO, which allows for a slight alteration as long as it borrows from color, line, form, pattern, and texture found in the existing valued landscape character. In the immediate foreground at a trail crossing, the 125-foot-wide construction right-of-way would be a significant contrast to the natural appearing, forested landscape since it would not borrow or mimic these visual elements. It would dominate the landscape character and, therefore, the contrast would not be consistent with a Moderate SIO. With mitigations described above for the long-term right-of-way that include planting woody vegetation on all but 10 feet centered over the pipe, the contrasts in color, texture, and line would decrease. However, the appearance and the character of the long-term right-of-way would not resemble the appearance and character of the rest of the trail and therefore would be noticeable to the casual observer, especially if the trail runs along the right-of-way for about 225 feet. For many, this would be an obvious man-made alteration that detracts from the individual trail experience. For others, it would add visual variety and views that would not necessarily detract from the recreation experience. Though mitigation measures would reduce the visual impacts, for this section of the trail, the permanent right-of-way would dominate the natural appearing landscape character and would not meet the Moderate SIO.

FS Road 348.1 Crossing (Access to Braley Pond Recreation Site)

The AP-1 mainline at about MP 116.4 would cross FS Road 348.1. This is the entry road to Braley Pond, a developed fishing and picnicking recreation site on the GWNF. The existing condition is roaded. This crossing location is about 1,000 feet from SR 715 and 3,000 feet from U.S. Highway 250. From SR 715 to the right-of-way crossing this road is proposed as an access road during construction. To the west of the crossing location is a small wooded hill; to the east is private land including open, pastoral land use just beyond a narrow band of trees. The removal of trees from the construction right-of-way on the GWNF (west) side of the road would be highly visible for about 365 feet to where the right-of-way crosses over the top of the hill. This is a low speed road, but the duration of view is still expected to be relatively short, and the angle of view is about 90 degrees. The construction right-of-way would dominate the characteristic landscape at that crossing. The mitigating measures that require the right-of-way to be revegetated with woody vegetation except 10 feet centered over the pipe would significantly reduce the visibility of this pipeline on the GWNF. The linear opening would mimic existing linear openings in the general vicinity such as roads. The long-term operating right-of-way would meet the Moderate SIO.

Dowell's Draft Trail Crossing Location

The Dowell's Draft Trail (FST 650) crossing location occurs near the confluence of Dowell's Draft and the East Branch of Dowell's Draft. Existing visual conditions include dense mixed hardwood forest and understory. The trail lies on a FS administrative use road (FSR 449) for about 800 feet in this location, and the road crosses Dowell's Draft creek adjacent to the proposed AP-1 crossing of the creek. The AP-1 mainline right-of-way would cross the trail at approximate MP 116.9 in the bottom of this narrow drainage. There would be immediate foreground views in both directions as the pipeline corridor climbs up short, low spur ridges on either side (about 350 feet to the east and 460 feet to the west of the trail). The right-of-way would cross FSR 449 twice: once where it crosses this trail on the west side of the creek and then again on the east side of the creek within view of the trail. FSR 449 is proposed as an access road during construction. The right-of-way would be prominent at this location, especially during and following construction due to the removal of vegetation in this stream valley. In addition to the 125-foot-wide construction right-of-way, there would be an ATWS located immediately adjacent to the trail and on the other side of the creek.

The extent of contrast introduced by the construction right-of-way would dominate the landscape character and therefore would not meet the Moderate SIO. With restoration of the ATWS location, and mitigations described above for restoration with woody vegetation of all but 10 feet centered over the pipe, the visibility of the corridor would decrease. While the right-of-way would continue to be visible to trail users, it occurs where the trail is concurrent with a FS road, and within 1,000 feet of SR 715 and within 2,800 feet of U.S. 250. The landscape character in the immediate vicinity includes the linear openings of three roads of different scales and levels of use. The 10-foot-wide herbaceous, linear opening, with shrubs and shallow rooted trees on either side, would be noticeable to the casual observer using the trail, but it would mimic the FS road upon which the trail is located. The long-term operating right-of-way would meet the Moderate SIO.

FS Road 466 Crossing (Access to White Oak Draft Trail)

The AP-1 mainline would cross FS Road 466 at about MP 120.3. This road is open to the public year-round and is used by some who want to access the White Oak Draft Trail (FST 486) about 1,000 feet north of the proposed pipeline crossing. Past management activities occurred along this road and immediately northeast of this site about 20 years ago. The lay of the land is similar to what is described above for Dowell's Draft. FS Road 466 lies in the narrow stream valley adjacent to White Oak Draft. There would be immediate foreground views in both directions as the pipeline climbs up short, low ridges. To the east, there is a bend in the right-of-way about 300 feet from the road, and to the west it crosses over a low hill about 460 feet from the road. This road is proposed as an access road during construction. The impacts on scenery would be similar to what is described above for Dowell's Draft Trail. The SIO of Moderate would not be achieved during and following the construction phase. After revegetation of most of the right-of-way, the remaining linear opening would be visible and noticeable to the casual observer, but it would be similar to the roadway. For those passing by in cars, the duration of view would be short. The long-term operation of the operational right-of-way, maintained per the mitigation measures, would not dominate the landscape character and therefore would meet the Moderate SIO.

Bald Ridge Trail and Trails on Hankey Mountain

Public comments received stated the draft EIS failed to address impacts on vistas enjoyed from several trails north of U.S. 250 in Augusta County in the North Shenandoah Mountain area recommended for National Scenic Area designation in the GWNF LRMP (FS, 2014). The FS ran additional viewshed analysis using GIS visibility tools and determined that segments of the AP-1 Mainline would be visible from portions of trails where there are openings in the forest canopy. The Friends of Shenandoah Mountain website contains photographs of open vista locations on Bald Ridge Trail (FST 496) and trails on Hankey Mountain, specifically the north end of Dowell's Draft Trail (FST 650) and southeast portion of the Wild Oak National Recreation Trail (FST 716).

From locations on Bald Ridge Trail, the construction and long-term right-of-way corridors would be visible on NFS lands at distances of 2.2 to 3.6 miles at about MPs 115.7 to 116.1 between Barn Lick Branch and Sulphur Spring Hollow and intermittently between MPs 117.1 and 118.0 east of Dowell's Draft Trail where the pipeline would cross just south of Chestnut Oak Knob. In this middleground distance and viewed from a superior vantage (viewed from above), the contrasts introduced to the landscape scenery and character by the construction right-of-way would be very visible, would begin to dominate the landscape character, and would not meet the Moderate SIO. With mitigations described above, the visibility of the corridor would decrease as the vegetation in the construction right-of-way and most of the long-term right-of-way matures. The view from the Bald Ridge Trail would not look down a length of the pipeline, but rather the pipeline would cross a portion of the view diagonally. Vegetation along the north edge of the corridor would partially to fully screen views of the herbaceous portion of the corridor centered over the pipeline. As vegetation in the corridor matures, the visible contrasts introduced by the project would decrease. At that time, the long-term right-of-way may be noticeable to the casual observer from locations on Bald Ridge Trail; however, the pipeline corridor would not dominate the landscape character.

On the ridge of Hankey Mountain along portions of the Wild Oak National Recreation Trail (FST 716) and Dowell's Draft Trail (FST 650) that total 1.3 miles combined, where there are openings in the forest to allow views, the proposed AP-1 Mainline would be intermittently visible at distances ranging from 1.4 to 3.6 miles from about MPs 118.0 to 120.5 along the crest of Camp Run Ridge and 121.1 to 123.0 along the crest of an unnamed ridge. The impacts on scenery would be similar to those described above for Bald Ridge Trail. Where visible from these trails, the construction right-of-way on these ridges would be highly visible and the alteration would dominate the natural appearing landscape character. The pipeline corridor would run nearly parallel to these trails on Hankey Mountain, and therefore the revegetation of the corridor would be effective at screening much or all the 10-foot-wide corridor to be maintained in herbaceous groundcover. The reduced or eliminated visibility of the corridor after revegetation would result in the Moderate SIO being achieved for the long-term operation of the pipeline. It may be visible in spots, but it would not be expected to dominate the landscape character.

U.S. Highway 250 – Hankey Mountain Highway

Comments received on the draft EIS stated that the proposed ACP would have detrimental effects on recreation developed sites and dispersed recreation areas such as Braley Pond, Staunton Dam, Elkhorn Lake, Todd Lake Campground, North River Campground, Confederate Breastworks, Hankey Mountain, and Ramsey's Draft Wilderness. The proposed pipeline on the national forest would not be visible from any of these locations except for trails on Hankey Mountain, including Bald Ridge Trail within Ramsey's Draft Wilderness, which are discussed in the section above. The potential impacts on these recreation areas would be the visibility of the pipeline corridor along the primary access route to these sites, U.S. Highway 250, and primarily only for those approaching on this route from the east. The point of the proposed pipeline centerline on the GWNF closest to U.S. 250 is about 0.4 mile (Camp Ridge) and the furthest point is about 1.0 mile (Jennings Gap). The crossing of U.S. 250 by the pipeline would occur off the national forest.

There are some mixed land uses along this route including residences with lawns, small pastures, and industrial and commercial buildings, but most of the landscape setting is forested, particularly on the north side of the road where the pipeline route is proposed. This forested buffer between U.S. Highway 250 and the proposed pipeline on the GWNF would screen the project from view. If any portions of the pipeline were to be visible, it would be during leaf-off and for a short duration of view since this is a high-speed road. From this travelway, it is anticipated that the project would meet the Moderate SIO.

Sherando Lake Recreation Area

Comments received on the draft EIS stated that the potential impacts on the entry route to Sherando Lake Recreation Area (Sherando) need to be assessed. One mile of the proposed AP-1 mainline is located on the GWNF in this vicinity. It is in the valley about 1.5 miles northeast of the entrance into the Sherando Lake Recreation Area. The pipeline on and off the national forest would run roughly parallel to State Route 664, the road used to access Sherando. In this valley, there is a patchwork of land uses, including forested areas (such as the GWNF ownership), pastoral, agricultural, commercial buildings, and residential buildings. For most who travel this road, the transition between private and public land is not evident. The landscape character is rural, and the recreation opportunity class is roaded natural.

The proposed pipeline corridor would be visible where it crosses SR 664 about 0.6 mile northwest of the GWNF tract, and it may be visible in other locations along the route. The majority of this would be on private land, not on the GWNF. The point of the proposed pipeline centerline on the GWNF closest to SR 664 is about 860 feet and the furthest point is about 2,600 feet. The construction activities and portions of the construction corridor would be noticeable to recreationists heading to and from Sherando. The contrasts of color, texture, pattern, and possibly line introduced by the construction corridor would not meet the Moderate SIO. The mitigation measures described above would significantly reduce the appearance of these contrasts and enable the project to meet the Moderate SIO within 5 years of construction.

<u>Visual Resources Conclusion</u>

Atlantic would cross the ANST using the HDD method. The HDD entry and exit points would be located about 1,400 feet and 3,400 feet, respectively, away from the ANST footpath, on private lands. These entry and exit points would not be visible to ANST users due to intervening vegetation and terrain. The High SIO would be achieved for the Rx 4A – ANST.

The ACP construction right-of-way would not be consistent with the Moderate SIO where the existing landscape character is the forested land use type that currently appears intact. The conversion of forest to a construction zone would introduce contrasts of color, texture, line, and pattern, and possibly of form where the pipeline would crest ridges and knobs. The construction right-of-way would not borrow from elements in the existing and desired landscape character. To reduce the impacts on the scenic resource, Atlantic would reduce its mowing to a 10-foot-wide strip centered over the pipeline, and reduce its trimming or selective cutting of trees to a 30-foot-wide strip centered over pipeline, per FERC *Plan*. Outside the 10-foot-wide strip, the remainder of the construction and long-term right-of-way would be revegetated using acceptable seed mixes, pollinator plants, shrubs, and trees in accordance with FERC *Plan* and as described in the draft *COM Plan*, which is being revised.

With these mitigation measures, within 5 years the long-term right-of-way would meet the Moderate SIO for all KOPs viewing the pipeline corridor on the GWNF, except for the Shenandoah Mountain Trail (FST 447) where the pipeline would cross that trail. For all other KOPs viewing the GWNF where there is a Moderate SIO, the long-term right-of-way may be noticeable to the casual observer, but it would not dominate the characteristic landscape.

4.8.9.2 National Park Service

Land Use and Ownership

Management of the BRP is one primary component of the mission of the NPS, an agency of the U.S. Department of the Interior. The NPS manages over 408 areas encompassing over 84 million acres, which includes national parks, monuments, battlefields, military parks, historical parks, historic sites, lakeshores, seashores, recreation areas, scenic rivers and trails (including some national scenic trails, national historic trails, and national recreation trails), and the White House (NPS, 2016i). As listed in table 4.8.9-1, ACP would cross 0.1 mile of NPS land associated with the BRP at AP-1 MP 158.1, which equates to BRP mile marker 13.7. NPS-administered land, specifically the BRP, would comprise less than 0.1 percent of all federal land crossed by ACP.

In addition to the BRP, the NPS is also the lead federal agency for the administration of the entire ANST; and the ANST, like BRP, is a "unit" of the national park system. On the ground, the 2,190-mile-long ANST transverses portions of more than 75 federal and state public agency land ownerships in 14 states. In the vicinity of ACP, the ANST is located on the GWNF and discussions of the ANST crossing are located in section 4.8.9.1 of this document.

Atlantic would avoid direct impacts on the BRP by using the HDD method to cross the feature. The BRP crossing would be included with the ANST crossing, discussed previously. While some minor hand cutting of brush to lay a guide wire for an HDD may be required between the two HDD entry points, Atlantic would use a gyroscopic guidance system at the ANST and BRP crossing that does not require a guide wire or associated brush clearing. The two HDD entry points would be located about 1,600 feet and 3,100 feet away from the trail. A temporarily closure or detour around the trail for recreationalists would not be needed, nor would the removal of vegetation and trees between the HDD entry and exit points. HDD activities at the entry points would last about 12 months and would likely be heard to users of the trail. This impact would be temporary. There would be no significant long-term or permanent loss of the natural, cultural, scenic, and recreational values of the ANST. A site-specific crossing plan for the ANST is included in appendix H.

No access roads would be located on NPS lands, and no aboveground facilities or contractor yards would be located on any federal lands. However, there would be minor appurtenances that include test stations and line markers, which would be entirely contained within the operational right-of-way as required by the DOT's PHMSA code.

We also analyzed an alternative crossing method at the ANST and BRP in section 3.3.4.3 in the event the HDD method is unsuccessful. The crossing method, referred to as the direct pipe, would still avoid direct impacts on the ANST and BRP, although the ATWS associated with the crossing would be closer to the trail and parkway. Regardless, there would be no significant long-term or permanent loss of the natural, cultural, scenic, and recreational values of the ANST should the alternative direct pipe crossing method be adopted.

As also discussed previously (see section 4.8.9.1, GWNF discussion), we have recommended that Atlantic file a final site-specific crossing plan and alternative direct pipe crossing plan for the ANST and BRP prior to construction and provide documentation that both plans have been reviewed by the GWNF and NPS.

Blue Ridge Parkway Management

The purposes of the BRP are to:

- connect Shenandoah and Great Smoky Mountains national parks by way of a "national rural parkway" – a destination and recreational road that passes through a variety of scenic ridge, mountainside, and pastoral farm landscapes;

- conserve the scenery and preserve the natural and cultural resources of the parkway's designed and natural areas;

- provide for public enjoyment and understanding of the natural resources and cultural heritage of the central and southern Appalachian Mountains; and

- provide opportunities for high-quality scenic and recreational experiences along the parkway and in the corridor through which it passes.

Per 16 U.S.C. 460a-3, the Secretary of the Interior may issue permits for rights-of-way over, across, and upon parkway lands for uses determined to be consistent with parkway purposes. As noted in the *BRP Environmental Assessment Information Guide for Right-of-Ways* (BRP, 2003):

> BRP has the legal authority under 16 USC 5 and 16 USC 79, as delegated, to grant an easement for a right-of-way to cross BRP administered lands for a period not exceeding 50 years provided that the right-of-way is not inconsistent with the use of such lands for BRP purposes.

In accordance with the NPS' "Application Procedure for Right-of-Way Permits (NPS, 2012):"

> All rights-of-way must be issued under legislative authority. Specific authorities exist for most utilities. Issuance of a revocable permit is discretionary based on NPS findings that the proposed use is not incompatible with natural, cultural, or visual resources, the public interest, or park policies.

Specific to management of the BRP is the *BRP, Virginia and North Carolina, Final General Management Plan (GMP)/EIS* (NPS, 2013). Management of the parkway is directed by zones established along the route. The management zones define "specific resource conditions, visitor experiences, appropriate recreational activities, and levels and types of development to be achieved and maintained in different areas of the parkway". Of the eight designated management zones established for the BRP, two would be crossed by ACP: the Scenic Character management zone and the Historic Parkway management zone (NPS, 2013). The definition of each management zone represents the general desired characteristics of the particular area.

- Historic Parkway: This zone represents areas that would emphasize protection and interpretation of the historic parkway corridor, which includes the road prism and its original supporting structures and constructed landforms.

- Scenic Character: This zone represents areas of the parkway that would emphasize protection and viewing opportunities of the scenic landscapes and natural and cultural settings of the central and southern Appalachian highlands.

The NPS' GMP/EIS (2013) further describes the desired conditions for resources within each zone.

As mentioned above, rights-of-way are discretionary based on a finding that the proposed use is not incompatible with natural, cultural, or visual resources, the public interest, or park policies. The Secretary of the Interior would evaluate the compatibility of the proposed Project against these criteria specific to the BRP crossing proposed by Atlantic. As of the issuance of this EIS, Atlantic has submitted its "Application Procedure for Right-of-Way Permits" request to the NPS (September 17, 2015; supplement April 27, 2016). A permit has not yet been issued by the NPS.

Recreation

The BRP is a nationally recognized scenic road extending 469 miles along the Blue Ridge Mountains in Virginia and North Carolina. The BRP receives over 15 million visitors a year and is estimated to provide $2.3 billion dollars annually to the region (NPS, 2013). Use of the BRP is focused on slow-paced travel that is free from commercial traffic and congestion (NPS, 2016j). The parkway offers 500,000 acres of scenic viewsheds within 1 mile of its boundary and there are nearly 300 overlooks along the way (NPS, 2013; 2016k). The peak seasons for travel along the BRP is between May and October due to the summer vacation season, and in October for viewing fall foliage (NPS, 2013). The NPS administers the parkway right-of-way, which averages 800 feet but can be as narrow as 200 feet (NPS, 2013).

Along with the ANST, Atlantic would cross the BRP using the HDD method, which would not require ground disturbance or vegetation clearing between the two HDD entry points. HDD activities and ATWS on either side of the parkway would be located about 2,050 feet and 2,650 feet away and shielded by the existing vegetation between the parkway and HDD entry points. Because impacts on the BRP would be avoided, ACP would not conflict with the desired conditions for the natural, cultural, or visual resources associated with the Historic Parkway and Scenic Character management zones.

NPS management policies require the agency preserve the park's natural soundscape and restore the degraded soundscape to the natural condition wherever possible. Additionally, the NPS is required to prevent or minimize degradation of the natural soundscape from noise generated by inappropriate or undesirable human-caused activities (NPS, 2013). Use of the HDD method does not require changes to the natural topography or vegetation removal on NPS land, which could otherwise affect the soundscape. HDD activities at the entry and exit points would last about 12 months and would likely be heard to users of the BRP should they exit their vehicles at the crossing location. This impact would be temporary. Impacts resulting from noise at HDD crossings is discussed further in section 4.11.2.2.

As discussed in the ANST section above, we analyzed in section 3.3.4.3 the direct pipe method as an alternative at the ANST and BRP crossings in the event the HDD method is unsuccessful. Similar to the HDD method, the direct pipe method would not require changes to the natural topography or vegetation removal on NPS land, which could otherwise affect the soundscape. Also discussed above (see section 4.8.9.1, GWNF discussion), we have recommended that, prior to construction, Atlantic provide a final site-specific crossing plan and alternative crossing plan (direct pipe contingency method) for the ANST and BRP that have been reviewed by the NPS.

Visual Resources

The NPS uses the SCS to manage and protect the scenic quality of views along the BRP corridor. The SCS contains detailed scenic assessments and desired scenic conditions that are similar to what is used in the FS SMS. The BRP is located within what NPS designates as the Scenic Character Zone, which focuses on protection of scenic landscapes and existing views along the BRP. The Scenic Character Zone would be the equivalent to a SMS High or Medium SIO. Most of the existing landscapes and views from the BRP are not located on NPS lands or directly managed by the NPS.

The AP-1 mainline would cross the BRP within the Scenic Character Zone, which is consistent with a High SIO. Existing visual conditions near the crossing of the BRP include dense, mature, mixed hardwood forest along Piney Mountain to the southeast, with views of the Three Ridges and other nearby ridges in the middleground and background. Atlantic would cross the BRP using the HDD method, which would avoid direct impacts on the parkway and not require tree or vegetation clearing between the HDD entry points, which are about 2,050 feet and 2,650 feet from the parkway. Minimal vegetation clearing would be required for ATWS; however, the existing trees, vegetation, and topography would block views of the ATWS for those traveling on the BRP. The AP-1 mainline crossing of the BRP would not result in visual impacts and be consistent with the Scenic Character Zone. Additional visual analysis along the BRP at designated scenic overlooks is described in section 4.8.9.1.

Key Observation Points

Seneca State Forest

In response to comments from the NPS, Atlantic conducted visual simulations for seven new KOPs near Seneca State Forest where the ACP could be visible from public trails, roads, and floatable rivers. Based on results of the simulations, the corridor would not be visible from four of the eight KOPs (SSF 02, 03, 04, and 07) due to intervening trees, vegetation, and topography. The following summarizes the impacts on visual resources at the remaining two KOPs near Seneca State Forest. Additional details regarding the visual surveys are included in the VIA (see appendix T).

KOP SSF 01: Greenbrier River Crossing

The ACP right-of-way would be clearly visible to the south as it crosses the Greenbrier River Trail at AP-1 MP 76.6. The right-of-way would be seen in the foreground by recreational users of the trail as a strip of cleared trees and vegetation that would create a strong visual contrast compared to the surrounding forested landscape. Regrowth of vegetation in the right-of way would reduce the extent of visual impacts; however, the right-of-way would remain as a dominant visual feature.

KOP SSF 05: Allegheny Trail

The ACP right-of-way would be collocated with the Allegheny Trail near AP-1 MP 78.1 and would be clearly visible in the foreground from that location. The corridor would be visible as a long strip of cleared trees and vegetation surrounded by forested areas. Direct views of the corridor would remain even after vegetation becomes reestablished.

KOP 39 – Blue Ridge Parkway at Three Ridges Overlook

Existing visual conditions at the Three Ridges Overlook include dense, mature hardwood forest along Piney Mountain and Three Ridges, and views of other nearby ridges in the middleground and background. The ACP right-of-way would be visible in the middleground at AP-1 MP 159, about 0.75 to 1.0 mile southeast of the KOP. ACP would likely be inconsistent with the NPS Scenic Character Zone due to the shorter distance between ACP and the viewer, topography, and visual contrasts created by the corridor in an area surrounded by forest.

Appalachian National Scenic Trail

Full visual simulations were conducted at nine additional KOPs along the ANST. The ACP right-of-way would be slightly visible from KOPs ANST 01 through ANST 04, and ANST 07. The right-of-way would be visible in the background; however, there would be little visual contrast in form, line, and color compared to the surrounding landscape. The right-of-way would not be a prominent visual feature in these locations and would not be inconsistent with existing SIO designations. The following summarizes the impacts on visual resources at the remaining four KOPs along the ANST. Additional details regarding the visual surveys are included in the VIA (see appendix T).

KOP ANST 05: Cedar Cliffs

The ACP right-of-way would be clearly visible between AP-1 MPs 153 and 156, which is about 0.8 mile from Cedar Cliffs along the ANST. The right-of-way would be visible in the middleground to the west as a cleared strip of land surrounded by vegetation with nearby agricultural fields. Collocating the pipeline along Back Creek and Mount Torrey Road would reduce the visual contrast across the landscape. Views would not be prominent and visual impacts would not be noticeable as vegetation becomes reestablished.

KOP ANST 06: Little Raven's Roost

Views of the ACP right-of-way between AP-1 MPs 152 and 156 from Little Raven's Roost would be similar to Cedar Cliffs. The right-of-way would be about 0.6 mile to the northwest and be visible in the middleground as a cleared strip of vegetation surrounded by forest. Existing vegetation and topography in the foreground would intermittently blocks views along the corridor and reduce the extent of visual impacts. Regrowth of vegetation would reduce visual contrast over time.

KOP ANST 8a: Three Ridges Overlook, North

The ACP right-of-way would be visible 0.7 to 1.0 mile to the southeast at ACP-1 MP 159 as it ascends Piney Mountain. A portion of the right-of-way would be clearly visible as a cleared strip of land surrounded by existing forest creating a strong visual contrast across the landscape.

KOP ANST 8b: Three Ridges Overlook, South

Views of the ACP right-of-way to the southeast and impacts on visual resources from the South Three Ridges Overlook would be the same as those described for KOP ANST 8a.

Visual Resources Conclusions

The ACP right-of-way would not impact views from any KOPs in the Seneca State Forest except for KOP SSF 01 at the Greenbrier River Trail and SSF 05 near the Allegheny Trail. Long-term visual impacts would occur due to the removal of trees and vegetation in forested areas. Based on consultations with West Virginia State Parks and WVDNR, Atlantic would relocate both trails to minimize visual impacts on recreational users of the trails. Site-specific crossing plans for each trail would be developed prior to relocation. The trail relocations are addressed in more detail in section 4.8.5.1.

Views of the ACP right-of-way from KOPs ANST 01 through 04 and ANST 07 would be imperceptible due to viewing distance, intervening vegetation, and topography, and, therefore, consistent with the Medium to High SIO designations in those areas. The ACP right-of-way would be visible in the middleground as a cleared linear strip of land from KOP ANST 05 at Cedar Cliffs and ANST 06 at Little Raven's Roost near Torrey Ridge. The right-of-way would be clearly visible along the ridge and valley but would not be a dominant visual feature due to existing visual intrusions such as roads and buildings. The corridor would also be visible from KOPs ANST 8a and 8b. Atlantic would plant additional shrubs and vegetation and feather the right-of-way to reduce visual contrast and impacts from those vantage points.

We received comments from the NPS that have requested consideration of additional avoidance, minimization, and mitigation measures to further reduce visual impacts from the three viewpoints on the ANST to help ensure protection of the ANST for future generations.

Blue Ridge Parkway and Appalachian National Scenic Trail Contingency Plan

Atlantic developed a contingency plan for crossing the ANST and BRP in the event that the proposed HDD crossing fails. Should multiple HDD attempts fail, Atlantic would use the direct pipe method to complete the crossing. A detailed description of the contingency plan is provided in section 3.3.4.3. Should the direct pipe option be required, the increase length of pipeline right-of-way would be visible along select portions of Beach Grove Road, Mt. Torrey Road, Reeds Gap Road, by various residences and business along these roads (e.g., Fenton Inn), and by residences along the northern portion of Fortunes Ridge. As part of the VIA, Atlantic conducted visual simulations from KOPs on the eastern and western side of the crossing area to determine if the pipeline right-of-way required for the direct pipe option would be visible from the ANST and BRP. Atlantic concluded that the visual impacts from the contingency plan would be the same as those for the proposed action, as discussed in the draft VIA (final VIA is pending). We have reviewed Atlantic's *BRP and ANST Contingency Plan* and find it acceptable. However, as discussed previously, the GWNF has provided only preliminary feedback and comments from the NPS have not yet been received. Therefore, we have recommended that Atlantic file a final site-specific crossing plan and alternative direct pipe crossing (contingency) plan for the ANST and BRP prior to construction and provide documentation that both plans have been reviewed by the NPS.

4.8.9.3 U.S. Fish and Wildlife Service

Great Dismal Swamp National Wildlife Refuge

In addition to the federal lands crossed and discussed in this section, ACP would be within 0.25 mile of the Great Dismal Swamp NWR between AP-3 MPs 71.8 and 76.0. Management of the National Wildlife Refuge System is one important component of the mission of the FWS, an agency of the U.S. Department of the Interior. The Great Dismal Swamp NWR, established in 1974, is the largest intact remnant of seasonally flooded wetland forest that once covered a large part of southeastern Virginia and northeastern North Carolina (FWS, 2016l). The primary purpose of the NWR is to restore and maintain the natural biological diversity that existed prior to the alterations caused by humans (FWS, 2008f).

Construction workspace associated with ACP would be 100 feet or greater from the NWR's boundaries and separated by an existing utility and Norfolk and Western Railroad rights-of-way. Similar to other special interest areas within 0.25 mile of the project, noise and visual impacts on recreationalists accessing the north part of the NWR could occur. These would be temporary and limited to the time of construction. During operation, moderate and permanent visual and noise impacts would result from clearing of trees from the nearby permanent right-of-way; however, recreational uses and continued management of the NWR would not be affected.

4.9 SOCIOECONOMICS

Several socioeconomic effects could occur in the states, commonwealths, counties, and communities in proximity to ACP and SHP during construction. Some of these potential effects are related to the number of construction workers that would work on the projects and their impact on population, public services, and temporary housing during construction. Other potential effects are related to construction, such as increased traffic or disruption of normal traffic patterns. Increased property tax revenue, increased job opportunities, and increased income associated with local construction employment are potential effects of the projects. Other potential effects include alteration of population levels or local demographics, increased employment opportunities, increased demand for housing and public services, tourism and transportation impacts, and an increase in government revenue associated with sales and payroll taxes.

4.9.1 Socioeconomic Study Area

The primary socioeconomic study area that we considered for this analysis includes the 32 counties and cities containing ACP and SHP project facilities (8 counties in West Virginia, 14 counties and cities in Virginia, 8 counties in North Carolina, and 2 counties in Pennsylvania). The following section analyzes impacts on the primary socioeconomic study area; however, because many parts of ACP and SHP are in rural areas, we have also identified a secondary study area. The secondary socioeconomic study area is defined as communities within a reasonable driving distance of project facilities. For this analysis, "reasonable driving distance" has been defined as a 50-mile radius centered on the pipeline centerline and major aboveground facilities. The secondary socioeconomic study area is made up of the 29 metropolitan statistical areas[22] within the 50-mile radius of ACP and SHP (see figure 4.9.1-1). Many communities within this 50-mile radius could be reasonably expected to experience impacts during the projects' construction period such as increases in traffic, increase in demand for lodging and services, and increase in local business sales. Where applicable, impacts on the secondary study area are analyzed.

4.9.2 Population and Employment

Based on 2014 population estimates, the population of all the counties and cities in ACP and SHP study area totals 2,090,064 people. ACP and SHP pipeline routes and accompanying construction work areas would generally be in rural areas, defined by the U.S. Census Bureau as an area with a population less than 50,000. With a small number of exceptions, most of the counties in the study area have population densities lower than that of their respective states. The seven counties and cities in the study area with population densities higher than that of their respective states are: Harrison County, West Virginia; the cities of Suffolk and Chesapeake, Virginia; Wilson, Johnston, and Cumberland Counties, North Carolina; and Westmoreland County, Pennsylvania. These counties and cities contain the major population centers within the study area.

The 2010[23] population of the eight West Virginia counties within the ACP and SHP study area range from 8,202 people in Doddridge County with a population density of 25.7 persons per square mile to 69,099 people in Harrison County with a population density of 166.1 persons per square mile (U.S. Census Bureau, 2010). The estimated 2014 population the West Virginia counties in the study area is 181,465 people, approximately 10 percent of the state population.

Population trends in the West Virginia counties within the ACP and SHP study area have varied over the past 14 years. Wetzel County, with a 2014 estimated population of 15,988, experienced the greatest population decrease (-9.6 percent) between 2000 and 2014. Counties also experiencing population decline during the same period were Lewis, Pocahontas, and Tyler. Doddridge County, with an estimated 2014 population of 8,391, experienced the greatest population increase (13.3 percent) between 2000 and 2014. Harrison, Randolph, and Upshur Counties also experienced population increases in the same period.

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[22] As defined by the U.S. Census Bureau, a metropolitan statistical area contains a core urban area of 50,000 or more population, consists of one or more counties containing the core urban area, as well as any adjacent counties with a high degree of social and economic integration with the urban core.

[23] The 2010 U.S. census data are presented here because the census is conducted every 10 years, which provides the official count of the population. Population counts provided by the American Community Survey (ACS) in between the decennial censuses are estimates. Both the 2010 census and ACS population estimates are appropriate to use to identify population trends.

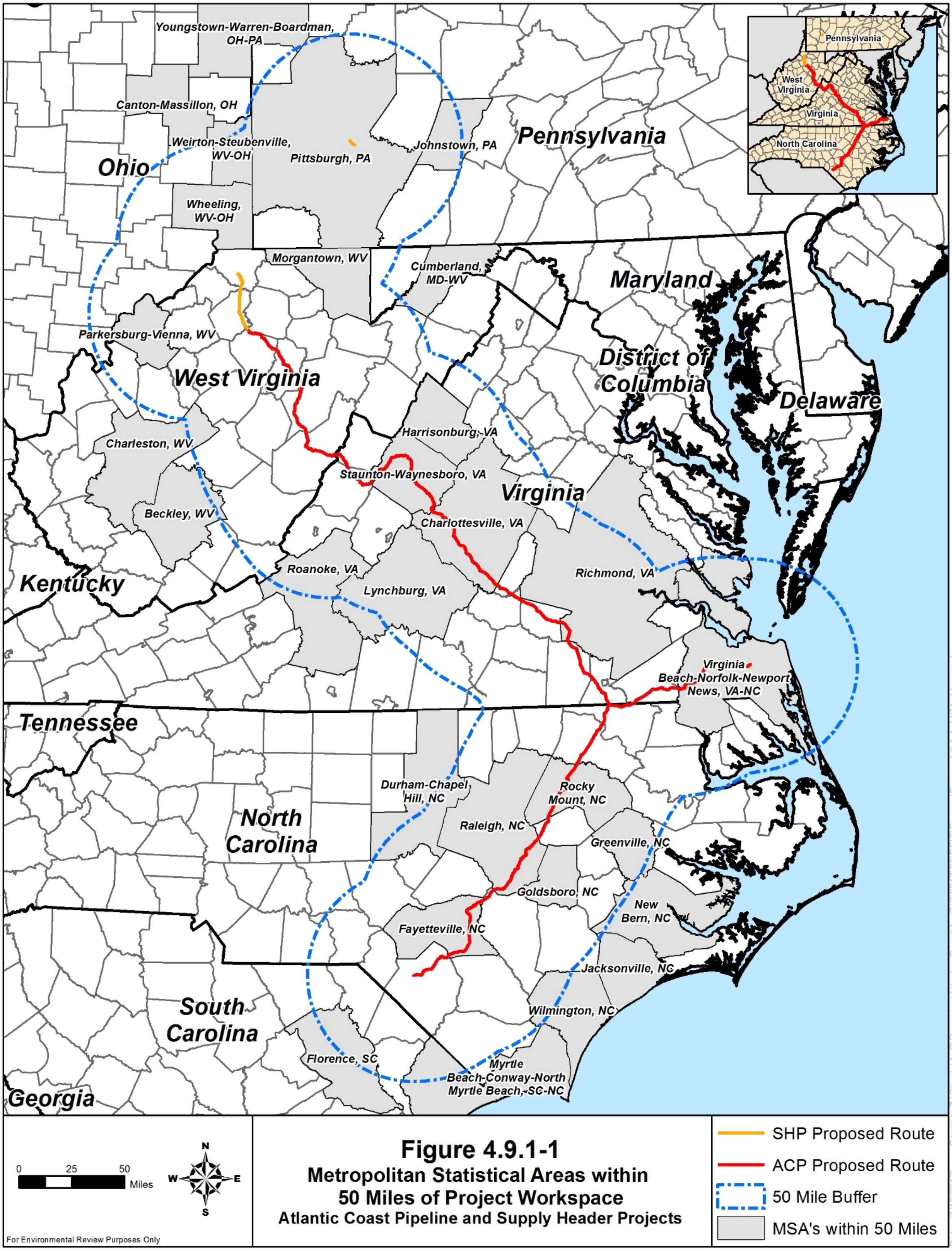

Figure 4.9.1-1
Metropolitan Statistical Areas within 50 Miles of Project Workspace
Atlantic Coast Pipeline and Supply Header Projects

In 2010, the population of the 14 Virginia counties and cities within the ACP study area ranged from 2,321 people in Highland County with a population density of 5.6 persons per square mile to 222,209 people in the City of Chesapeake with a population density of 652.0 persons per square mile (U.S. Census Bureau, 2010). The estimated 2014 population of all Virginia counties in the study area is 555,675 people, approximately 8 percent of the state population.

Most of the Virginia counties and cities in the ACP study area have experienced steady population growth over the past 14 years. The City of Suffolk, with a 2014 estimated population of 86,806, experienced the greatest population growth (36.3 percent) between 2000 and 2014. All other counties and cities in the study area in Virginia experienced population growth except for Nottoway, Brunswick, Bath, and Highland Counties. Highland County, with an estimated 2014 population of 2,248, experienced the greatest population decline (-11.4 percent) in the entire study area in the years between 2000 and 2014.

The 2010 population of the eight North Carolina counties within the ACP study area ranged from 22,099 people in Northampton County with a population density of 41.2 persons per square mile to 319,431 people in Cumberland County with a population density of 489.7 persons per square mile (U.S. Census Bureau, 2010). The estimated 2014 population of all North Carolina counties in the study area is 955,752 people, approximately 10 percent of the state population.

Most of the North Carolina counties in the ACP study area have experienced moderate to large growth in population over the past 14 years. Johnston County, with a 2014 estimated population of 181,423, experienced the greatest population growth (48.8 percent) in the entire study area between 2000 and 2014. All other counties and cities in the study area in North Carolina experienced population growth except for Northampton and Halifax Counties. Halifax County, with an estimated 2014 population of 52,970, experienced the greatest population decline (-7.7 percent) between 2000 and 2014.

In 2010, the population of the two Pennsylvania counties within the SHP study area ranged from 38,686 people in Greene County, with a population density of 67.2 persons per square mile, to 365,169 people in Westmoreland County, with a population density of 355.4 persons per square mile (U.S. Census Bureau, 2010). The estimated 2014 population of all Pennsylvania counties in the study area is 397,163 people, approximately 3 percent of the state population.

The two Pennsylvania counties in the SHP study area have experienced population declines over the past 14 years. Westmoreland County, with a 2014 estimated population of 359,320, experienced a -2.9 percent population decline while Greene County, with a 2014 estimated population of 37,843, experienced a -7.0 percent decline in population between 2000 and 2014.

Table 4.9.2-1 presents existing population levels and trends for counties and cities in the ACP and SHP study area.

Table 4.9.2-2 presents the civilian workforce numbers, per capita incomes, unemployment rates, and the leading three industries for the United States, West Virginia, Virginia, North Carolina, and Pennsylvania, and the counties and cities in the ACP and SHP study area.

TABLE 4.9.2-1

Existing Population Levels and Trends for the Atlantic Coast Pipeline and Supply Header Project Socioeconomic Study Area

Project/Location	2000 Population [a]	2010 Population [b]	2014 Population Estimate [c]	Population Density (persons/sq. mi) (2010) [b]	Population Change 2000 - 2014	Population Change 2010 - 2014
United States	**281,421,906**	**308,745,538**	**318,857,056**	**7.4**	**13.3**	**3.3**
ATLANTIC COAST PIPELINE						
West Virginia	**1,808,344**	**1,852,994**	**1,850,326**	**77.1**	**2.3**	**-0.1**
Harrison	68,652	69,099	68,761	166.1	0.2	-0.5
Lewis	16,919	16,372	16,414	42.5	-3.0	-0.3
Upshur	23,404	24,254	24,731	68.4	5.7	2.0
Randolph	28,262	29,405	29,429	28.3	4.1	0.1
Pocahontas [d]	9,131	8,719	8,662	9.3	-5.1	-0.7
Virginia	**7,078,515**	**8,001,024**	**8,326,289**	**202.6**	**17.6**	**4.1**
Highland [d]	2,536	2,321	2,248	5.6	-11.4	-3.1
Bath [d]	5,048	4,731	4,563	8.9	-9.6	-3.6
Augusta [d]	65,615	73,750	73,862	76.3	12.6	0.2
Nelson [d]	14,445	15,020	14,850	31.9	2.8	-1.1
Buckingham	15,623	17,146	16,913	29.6	8.3	-1.4
Cumberland	9,017	10,052	9,827	33.8	9	-2.2
Prince Edward	19,720	23,368	23,074	66.8	17	-1.3
Nottoway	15,725	15,853	15,579	50.4	-0.9	-1.7
Dinwiddie	24,533	28,001	27,859	55.6	13.6	-0.5
Brunswick	18,419	17,434	16,498	30.8	-10.4	-5.4
Greensville	11,560	12,243	11,681	41.5	1	-4.6
Southampton	17,482	18,570	18,059	31	3.3	-2.8
City of Suffolk	63,677	84,585	86,806	211.4	36.3	2.6
City of Chesapeake	19,184	222,209	233,371	652	17.2	5
North Carolina	**8,049,313**	**9,535,483**	**9,943,964**	**196.1**	**23.5**	**4.3**
Northampton	22,086	22,099	20,463	41.2	-7.3	-7.4
Halifax	57,370	54,691	52,970	75.5	-7.7	-3.1
Nash	87,420	95,840	94,357	177.3	7.9	-1.5
Wilson	73,814	81,234	81,401	220.6	10.3	0.2
Johnston	121,965	168,878	181,423	213.4	48.8	7.4
Sampson	60,161	63,431	64,050	67.1	6.5	1
Cumberland	302,963	319,431	326,328	489.7	7.7	2.2
Robeson	123,339	134,168	134,760	141.3	9.3	0.4
SUPPLY HEADER PROJECT						
Pennsylvania	**12,281,054**	**12,702,379**	**12,787,209**	**283.9**	**4.1**	**0.7**
Westmoreland	369,993	365,169	359,320	355.4	-2.9	-1.6
Greene	40,672	38,686	37,843	67.2	-7	-2.2
West Virginia	**1,808,344**	**1,852,994**	**1,850,326**	**77.1**	**2.3**	**-0.1**
Wetzel	17,693	16,583	15,988	46.3	-9.6	-3.6
Tyler	9,592	9,208	9,098	35.9	-5.2	-1.2
Doddridge	7,403	8,202	8,391	25.7	13.3	2.3
Harrison	68,652	69,099	68,761	166.1	0.2	-0.5

[a] U.S. Census Bureau, 2010.
[b] U.S. Census Bureau, 2013.
[c] Source: U.S. Census Bureau, 2015.
[d] Counties with federal lands crossed by the projects.

TABLE 4.9.2-2

Existing Economic Conditions for the Atlantic Coast Pipeline and Supply Header Project Study Area

Project/Location	Per Capita Income (U.S. Dollars) [a]	Civilian Labor Force [a]	Top Three Industries [b]	Unemployment Rate [c, d]
ATLANTIC COAST PIPELINE				
West Virginia	**$22,966**	**825,927**	**E, R, A**	**6.5**
Harrison	$23,309	31,932	E, R, P	5.3
Lewis	$21,175	7,027	E, R, Ag	6.2
Upshur	$19,498	10,130	E, R, Ag	6.6
Randolph	$19,595	12,611	E, R, Pu	7.1
Pocahontas [e]	$20,373	3,826	E, A, C	8.6
Virginia	**$33,493**	**4,154,410**	**E, P, R**	**5.2**
Highland [e]	$26,372	1,108	C, Ag, E	3.8
Bath [e]	$28,704	2,275	A, E, C	4.4
Augusta [e]	$25,519	35,714	E, M, R	4.7
Nelson [e]	$26,059	7,224	E, R, A	4.8
Buckingham	$17,167	6,237	E, R, Pu	6.6
Cumberland	$21,540	4,731	E, Pu, A	6.1
Prince Edward	$17,208	9,802	E, A, R	7.8
Nottoway	$19,337	6,963	E, Pu, R	5.4
Dinwiddie	$23,781	13,578	E, M, R	6.4
Brunswick	$16,060	6,948	E, R, Pu	8.2
Greensville	$16,380	3,981	M, E, R	6.7
Southampton	$22,433	8,812	E, R, Pu	5.0
City of Suffolk	$29,135	41,772	E, M, R	5.8
City of Chesapeake	$29,905	113,620	E, R, P	5.3
North Carolina	**$25,284**	**4,743,685**	**E, M, R**	**6.1**
Northampton	$17,919	9,227	E, M, Pu	7.9
Halifax	$17,937	22,911	E, M, R	9.5
Nash	$22,880	47,560	E, M, R	7.9
Wilson	$20,972	87,265	E, M, R	9.3
Johnston	$22,410	39,438	E, R, M	5.5
Sampson	$19,479	30,748	E, M, Ag	6.2
Cumberland	$23,067	134,206	E, R, A	7.8
Robeson	$15,343	54,731	E, M, R	9.2
SUPPLY HEADER PROJECT				
Pennsylvania	**$28,502**	**6,478,705**	**E, M, R**	**5.8**
Westmoreland	$28,051	184,895	E, M, R	5.7
Greene	$21,819	16,300	E, Ag, R	5.4
West Virginia	**$22,966**	**825,927**	**E, R, A**	**6.5**
Wetzel	$21,653	6,128	E, C, R	10.3
Tyler	$20,704	3,636	E, M, R	8.9
Doddridge	$17,334	3,181	E, R, Ag	4.9
Harrison	$23,309	31,932	E, R, P	5.3

[a] U.S. Census Bureau, 2015.

[b] Industries are defined under the 2012 North American Industry Classification System and abbreviated as follows: A = Arts, Entertainment, and Recreation, and Accommodation and Food services; Ag = Agriculture, Forestry, Fishing, and Hunting, and Mining; C = Construction; E = Educational, Health and Social Services; F = Finance and Insurance, and Real Estate and Rental and Leasing; I = Information; M = Manufacturing; O = Other Services, except Public Administration; P = Professional, Scientific, Management, Administrative, and Waste Management Services; Pu = Public Administration; R = Retail Trade; T = Transportation and Warehousing, and Utilities; W = Wholesale Trade.

[c] Bureau of Labor Statistics, 2014a.

[d] Bureau of Labor Statistics, 2014b.

[e] Counties with federal lands crossed by the projects.

Major industries in the West Virginia counties crossed by the within ACP and SHP are: educational health and social services; retail trade; and agriculture, forestry, fishing and hunting, and mining. According to the 2013 American Community Survey (ACS) data, the total civilian workforce in these counties is 78,471 people. The county-level civilian workforces range from 3,181 people in Doddridge County to 31,932 people in Harrison County. The estimated per capita income in 2013 in the West Virginia counties range from $17,334 in Doddridge County to $23,309 in Harrison County, with all but Harrison County having per capita incomes below the state average of $22,966. The unemployment rate is 6.5 percent in West Virginia, which is slightly higher than the national average of 6.2 percent. Five of the eight counties in West Virginia have 2014 unemployment rates that are lower than the state average. Unemployment rates within the counties in the study area vary between a high of 10.3 percent in Wetzel County and a low of 4.9 percent in Doddridge County.

Based on the 2013 ACS data, the primary industries in the Virginia counties and cities crossed by ACP are: educational health and social services; retail trade; and public administration. The total civilian workforce in these counties is 262,765 people. The county- and city-level civilian workforces range from 1,108 people in Highland County to 113,620 people in the city of Chesapeake. The estimated per capita income in 2013 in the Virginia counties and cities in the study area range from $16,060 in Brunswick County to $29,905 in the city of Chesapeake. All the Virginia counties and cities in the study area have per capita incomes below the state average of $33,493. The unemployment rate is 5.2 percent in Virginia, which is a percent lower than the national average of 6.2 percent. Ten of the 14 counties and cities in Virginia have 2014 unemployment rates that are lower than the state average. Unemployment rates within the counties and cities in the study area vary between a high of 8.2 percent in Brunswick County and a low of 3.8 percent in Highland County.

The top three industries in the North Carolina counties crossed by ACP are: educational health and social services; manufacturing; and retail trade. Based on 2013 ACS data, total civilian workforce in these counties is 426,086 people. The county-level civilian workforces range from 9,227 people in Northampton County to 134,206 people in the Cumberland County. The estimated per capita income in 2013 in the North Carolina counties in the study area range from $15,343 in Robeson County to $23,067 in Cumberland County. All the North Carolina counties in the study area have per capita incomes below the state average of $25,284. The unemployment rate is 6.1 percent in North Carolina, which is on par with the national average of 6.2 percent. All the counties in North Carolina, except for Johnston County have 2014 unemployment rates higher than the state average. Unemployment rates within the counties in the study area vary between a high of 9.5 percent in Halifax County and a low of 5.5 percent in Johnston County.

The top three industries in the Pennsylvania counties crossed by SHP are: educational health and social services; manufacturing; and retail trade. The total civilian workforce in these counties is 201,195 people. The county-level civilian workforces range from 16,300 people in Greene County to 184,895 people in the Westmoreland County. The estimated per capita income in 2013 in the Pennsylvania counties in the study area range from $21,819 in Greene County to $28,051 in Westmoreland County. Both Pennsylvania counties in the study area have per capita incomes below the state average of $28,502. The unemployment rate is 5.8 percent in Pennsylvania, slightly lower than the national average of 6.2 percent. Both Pennsylvania counties have 2014 unemployment rates lower than the state average.

Construction of ACP and SHP would temporarily increase the population in the general project area. Construction of ACP would occur over a 2-year period, beginning November 2017 through the end of 2019. Table 4.9.2-3 outlines the estimated construction schedule and peak workforce requirements for the construction of ACP and SHP. Atlantic estimates that approximately 8,400[24] total workers would be used to build ACP, all of whom would be working during peak construction. DETI estimates that approximately 1,970 construction workers would be used to construct SHP, all of whom would be working at peak construction. Peak construction is estimated to occur from mid-2018 to mid-2019 when work would be ongoing on multiple pipeline spreads and compressor stations. Population impacts resulting from construction of ACP and SHP are expected to be temporary and, given the existing populations of the counties and cities in the study area, minor. The effect on the population would be equal to the total number of non-local construction workers plus any family members accompanying them. Pipeline construction is mobile, of a short duration; and in our experience most non-local workers would not travel with their families to the ACP and SHP study area, thus minimizing temporary impacts on the local populations. Based on the populations of the counties and cities within the ACP and SHP study area, in the event some construction workers and their families do temporarily relocate to the area, the increase in population would not be significant. In addition, any temporary increase in population would be distributed throughout the study area and would not have a permanent impact on any one population.

Atlantic and DETI estimate that 82 and 10 permanent employees would be employed to support operations of ACP and SHP project facilities, respectively. Of the 82 permanent workers employed for operations of ACP, 22 jobs would be in West Virginia, 39 jobs in Virginia, 20 jobs in North Carolina, and 1 job in South Carolina. For SHP, 8 of the 10 jobs would be in West Virginia, with the remaining 2 jobs in Pennsylvania. Table 4.9.2-4 outlines the number and employment location of permanent employees for ACP and SHP. It is unknown as to whether these permanent, full-time employees would reside within commuting distance or if they would be non-local hires. Regardless, based on the county and city populations in the study area and the limited number of new, permanent employees to be hired, permanent population effects as a result of operation of ACP and SHP would be minor.

In addition to direct hires, it is reasonable to expect that the construction of ACP and SHP would result in many temporary, indirect jobs as purchases for goods and services would increase along with the influx of the construction workforce to the project area. Indirect employment, including hiring additional staff in the retail and service industries to accommodate the increase in demand for food, clothing, lodging, gasoline, and entertainment, would have a temporary stimulating effect on local economies. These indirect jobs would represent a temporary, minor increase in employment opportunities in the project area, as discussed further in section 4.9.8.

[24] Total construction workforce was estimated using the following formula: 800 construction workers and 85 inspectors for 9 construction spreads (4 of the crews used to construct the spreads in 2018 would also be used to construct spreads in 2019; Spread 12 is expected to be constructed using workers from other spreads); 225 total compressor station workers; and 30 M&R station workers at 7 stations (2 of the crews used to construct stations would also be used to construct 2 other stations).

TABLE 4.9.2-3 **Construction Workforce and Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]**					
Project/Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Peak Workforce [b]	Begin Construction	Finish Construction [c]
ATLANTIC COAST PIPELINE					
Initial Construction Activities					
Initial Site Preparation (2018 spreads)	By spread	See below	150 [d]	November 2017	1Q 2018
Tree Clearing (2018 spreads) [e, f]	By spread	See below	300 [d]	November 2017	1Q2018
Initial Site Preparation (2019 spreads)	By spread	See below	150 [d]	September 2018	1Q 2019
Tree Clearing (2019 spreads) [e, f]	By spread	See below	300 [d]	November 2018	1Q 2019
Construction of Pipeline					
Spread 1 (AP-1)	0.0–31.6	Harrison, Lewis, and Upshur Counties, WV	885	April 2019	4Q 2019
Spread 2 (AP-1) [i]	31.6–56.1	Upshur and Randolph Counties, WV	885	April 2018	4Q 2018
Spread 2A (AP-1) [i]	56.1–65.4	Randolph County, WV	885	April 2018	4Q 2018
Spread 3 (AP-1)	65.4–79.2	Randolph and Pocahontas [h] Counties, WV	885	April 2019	4Q 2019
Spread 3A (AP-1) [i]	79.2–91.3	Pocahontas County, WV and Highland County, VA [h]	885	April 2018	4Q 2018
Spread 4 (AP-1)	91.3–103.1	Highland and Bath Counties, VA [h]	885	April 2019	4Q 2019
Spread 4A (AP-1) [i]	103.1–125.9	Bath and Augusta Counties, VA [h]	885	April 2018	4Q 2018
Spread 5 (AP-1) [j]	125.9–183.3	Augusta and Nelson Counties, VA [h]	885	February 2019	4Q 2019
Spread 6 (AP-1) [j]	183.3–239.6	Nelson [h], Buckingham, Cumberland, Prince Edward, and Nottoway Counties, VA	885	February 2018	4Q 2019
Spread 7 (AP-1)	239.6–300.0	Nottoway, Dinwiddie, Brunswick, and Greensville Counties, VA, and Northampton County, NC	885	February 2019	4Q 2018
Spread 8 (AP-2)	0.0–61.6	Northampton, Halifax, and Nash Counties, NC	885	February 2018	4Q 2018
Spread 9 (AP-2)	61.6–125.0	Nash, Wilson, Johnston, Sampson, and Cumberland Counties, NC	885	February 2019	4Q 2019
Spread 10 (AP-2)	125.0–183.0	Cumberland and Robeson Counties, NC	885	February 2018	4Q 2018
Spread 11 (AP-3)	0.0–83.0	Northampton County, NC, Greensville and Southampton Counties, VA, and the Cities of Suffolk and Chesapeake, VA	885	February 2018	4Q 2018

TABLE 4.9.2-3 (cont'd)

Construction Workforce and Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Peak Workforce [b]	Begin Construction	Finish Construction [c]
Spread 12 (AP-4; AP-5)	0.0–0.4; 0.0-1.1	Brunswick County, VA; Greensville County, VA	0 [g]	February 2018	4Q 2018
Construction of Compressor Stations					
Compressor Station 1	7.6	Lewis County, WV	75	November 2017	4Q 2019
Compressor Station 2	191.5	Buckingham County, VA	75	November 2017	4Q 2019
Compressor Station 3	300.1	Northampton County, NC	75	November 2017	4Q 2019
Construction of M&R Stations					
Kincheloe	7.6	Lewis County, WV	30	November 2017	4Q 2019
Long Run	47.2	Randolph County, WV	30	April 2018	4Q 2019
Woods Corner	191.5	Buckingham County, VA	30	November 2017	4Q 2019
Smithfield	92.7	Johnston County, NC	30	November 2017	3Q 2019
Fayetteville	132.9	Johnston County, NC	30	February 2018	3Q 2019
Pembroke	183.0	Robeson County, NC	30	March 2018	3Q 2019
Elizabeth River	83.0	City of Chesapeake, VA	30	April 2018	3Q 2019
Brunswick	0.4	Brunswick County, VA	30	January 2018	3Q 2019
Greensville	1.1	Greensville County, VA	30	February 2018	3Q 2019
SUPPLY HEADER PROJECT					
Initial Construction Activities					
Initial Site Preparation (Spread 13)	By spread	See below	50 [d]	November 2017	1Q 2018
Tree Clearing (Spread 13) [e, f]	By spread	See below	65 [d]	November 2017	1Q 2018
Initial Site Preparation (Spread 14)	By spread	See below	30 [d]	November 2018	1Q 2019
Tree Clearing (Spread 14) [e, f]	By spread	See below	20 [d]	November 2018	1Q 2019
Construction of Pipeline Spreads					
Spread 13 (TL-635)	0.0–33.6	Wetzel, Doddridge, Tyler, and Harrison Counties, WV	885	April 2018	4Q 2019
Spread 14 (TL-636)	0.0–3.9	Westmoreland County, PA	885	January 2019	4Q 2019
Construction of Compressor Station Modifications					
JB Tonkin	0.0	Westmoreland County, PA	50	February 2018	3Q 2019
Crayne	NA	Greene County, PA	50	February 2018	3Q 2019
Burch Ridge	NA	Marshall County, WV	50	April 2019	4Q 2019
Mockingbird Hill	0.0	Wetzel County, WV	50	February 2018	4Q 2019
Abandonment of Gathering Compressor Units					
Hastings	NA	Wetzel County, WV	TBD	January 2019	4Q 2019

TABLE 4.9.2-3 (cont'd)

Construction Workforce and Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Peak Workforce [b]	Begin Construction	Finish Construction [c]

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements.

[b] The peak workforce for pipeline spreads includes 800 construction workers and 85 inspectors.

[c] The finish construction date refers to the end of mechanical construction; additional restoration and post construction activity is expected to occur in the project area beyond the timeframe reflected here. 1Q = first quarter; 2Q = second quarter; 3Q = third quarter; 4Q = fourth quarter.

[d] The workers used for initial construction activities are also expected to work on pipeline construction spreads.

[e] The start of tree clearing is dependent upon the results of the environmental surveys, agency consultations, and a Notice to Proceed issued by FERC, and possibly other permits.

[f] Including tree clearing for aboveground facilities, access roads, and contractor yards. Tree clearing for construction spreads 1-1, 1-2, 3, 4, the BRP HDD, and the James River HDD would take place in 2018.

[g] Spread 12 would be completed with spread 11 and is counted as one spread. Therefore, Spread 12 is expected to be constructed by workers accounted for in other spreads.

[h] Counties with federal lands crossed by the projects.

[i] Based on current estimates, hydrostatic testing and remaining cleanup would be completed by the 3rd quarter of 2019.

[j] The HDD crossings of the James River and the BRP/ANST would be constructed in 2018.

TABLE 4.9.2-4

Number and Location of Permanent Employees for the Atlantic Coast Pipeline and Supply Header Project

Project/Location	Number of Permanent Employees	Employment Location
ATLANTIC COAST PIPELINE		
West Virginia		
Harrison	4	Clarksburg office
Lewis	13	Compressor Station 1; Weston office (5)
Randolph	5	Elkins office
Virginia		
Buckingham	9	Compressor Station 2
City of Suffolk	1	Office
City of Richmond	29	Dominion headquarters office
North Carolina		
Northampton	15	Compressor Station 3 and office
Johnston	5	Office
South Carolina		
City of Columbia	1	Office
SUPPLY HEADER PROJECT		
Pennsylvania		
Westmoreland	2	JB Tonkin Compressor Station
West Virginia		
Wetzel	8	Mockingbird Hill Compressor Station

4.9.3 Housing

Housing statistics for the ACP and SHP study area are listed in table 4.9.3-1. At least 2,100 hotels, motels, and campgrounds are available within the ACP and SHP study area, along with over 200,000 rental housing units located in the affected counties and cities. While the study area is concentrated to the counties and cities where ACP and SHP facilities would be located, we expect some construction workers would commute up to 50 miles. There are 29 metropolitan statistical areas within 50 miles of ACP and SHP (as shown in table 4.9.3-1). These areas provide many options for hotels and motels if options are not available in smaller communities in the study area, and would be sufficient to accommodate the estimated non-local construction workforce and non-local operations workforce.

The availability of housing in the ACP and SHP study area may fluctuate during the tourist season or local events as well as due to demand on housing from other industries. The average rental vacancy rate throughout the ACP and SHP study area is 8.6. The highest rental vacancy rates (i.e., over 10 percent) in the study area are in the following counties: Pocahontas, Randolph, and Wetzel (West Virginia); Bath, Nelson, and Dinwiddie (Virginia); and Johnston (North Carolina). See table 4.9.3-1 for the rental vacancy rates of each county and city in the ACP and SHP study area.

Atlantic and DETI estimate that approximately 50 percent of the workforce would be non-local. That equates to approximately 5,815 non-local workers representing a demand on local temporary housing in the ACP and SHP study area. Using a conservative estimate of 25 units per hotel/motel or campground, of which there are approximately 2,115, we estimate that there are at least 52,875 rooms/sites available in the study area. Given the rental vacancy vacancies in the counties and cities in the study area (between 0.6 percent in Cumberland County and 59.6 percent in Pocahontas County) and number of hotel/motel rooms available in study area, there are sufficient vacant housing units to meet the increase in demand caused by the influx of the non-local construction workforce.

In the event that non-local workers prefer to house in a hotel/motel or campground and the number identified in this primary analysis area (i.e., the counties and cities where ACP and SHP cross or facilities are located) does not meet the need within a particular county or city, it can be reasonably expected that construction workers could find housing options in the nearby metropolitan statistical areas (see figure 4.9.1-1).

The influx of non-local construction workers to the ACP and SHP study area would result in a minor, temporary increase in the demand for rental housing and/or hotel/motel rooms and campground sites. The projects could have a short-term positive impact on the area rental industry through increased demand and higher rates of occupancy; however, no significant impacts on local housing markets are expected. Increased demand in the study area could benefit the proprietors of the local motels, hotels, and other rental units through increased revenue; however, it could increase competition (and cost) for short-term housing and could decrease housing availability for tourists, recreationalists, and local renters or residents. While some construction activity would be conducted during the peak tourism season, sufficient temporary housing is still likely to be available for tourists; however, it may be more difficult to find (particularly on short notice) and/or more expensive to secure.

Based on the large number of accommodations in the ACP and SHP study area and surrounding areas, we have determined that rental housing accommodations along with hotels, motels, and campgrounds, would be sufficient to house the non-local construction workforce without significantly impacting or displacing tourists or local renters and residents. The increase in demand for short-term housing from non-local construction workers during the construction of ACP and SHP would be temporary and minor. In addition, we conclude the estimated 92 non-local employees needed during operations would not have a noticeable impact on housing resources in the project area.

TABLE 4.9.3-1

Available Housing in the Atlantic Coast Pipeline and Supply Header Project Study Area

Location	Total Housing Units [a]	Owner Occupied [a]	Renter Occupied [a]	Median Gross Rent ($) [a]	Rental Vacancy Rate (%) [a]	Vacant Housing Units	Hotels and Motels [b]	Campgrounds/ RV Parks [c]
ATLANTIC COAST PIPELINE								
West Virginia	880,951	544,059	197,331	611	7.8	139,561	1,508	297
Harrison	31,443	20,508	7,091	615	7.1	3,844	65	3
Lewis	7,928	4,617	1,834	507	3.2	1,477	41	4
Upshur	11,082	6,955	2,056	566	6.7	2,071	43	8
Randolph	11,163	8,396	2,767	534	10.4	3,000	49	6
Pocahontas [c]	8,814	3,023	671	578	59.6	5,120	48	8
Virginia	3,381,332	2,033,102	989,637	1,087	6.7	358,593	4,008	353
Highland [c]	1,840	868	138	490	4.8	834	32	2
Bath [c]	3,242	1,600	501	764	10.8	1,141	43	5
Augusta [c]	31,362	22,662	5,337	743	7.2	3,363	129	9
Nelson [c]	9,957	4,856	1,548	709	13.0	3,553	49	5
Buckingham	7,224	4,420	1,397	708	0.8	1,407	36	6
Cumberland	4,627	3,134	915	838	0.6	578	29	5
Prince Edward	9,170	4,856	2,597	760	3.9	1,717	16	2
Nottoway	6,670	3,674	1,999	802	2.8	997	32	3
Dinwiddie	11,452	7,607	2,325	905	16.5	1,520	48	7
Brunswick	8,140	4,207	1,619	617	8.3	2,314	55	6
Greensville	4,093	2,568	821	720	8.2	704	61	6
Southampton	7,492	4,815	1,893	734	5.7	784	33	3
Suffolk, City of	33,372	22,373	8,119	986	6.9	2,880	70	3
Chesapeake, City of	84,403	57,579	21,842	1,160	5.6	4,982	203	10
North Carolina	4,349,023	2,466,388	1,249,177	776	8.7	633,458	4,947	683
Northampton	11,587	6,276	2,328	622	5.6	2,983	57	4
Halifax	17,990	10,672	4,098	568	7.4	3,220	54	5
Nash	42,256	24,186	13,540	751	6.7	4,530	89	3
Wilson	35,520	19,314	12,376	738	4.9	3,830	86	4
Johnston	68,000	43,495	17,264	778	10.3	7,241	60	10
Sampson	27,083	16,147	7,189	572	8.2	3,747	48	5
Cumberland	138,362	66,427	54,799	853	8.5	17,136	115	7
Robeson	52,412	29,311	15,843	592	6.5	7,258	79	4
SUPPLY HEADER PROJECT								
Pennsylvania	5,565,653	3,462,512	1,495,915	813	6.1	607,226	4,738	720
Westmoreland	168,084	116,000	36,109	637	4.8	15,975	96	14
Greene	16,427	10,526	3,891	597	4.7	2,010	47	20
West Virginia	880,951	544,059	197,331	611	7.8	139,561	1,508	297
Wetzel	8,152	5,473	1,430	494	11.4	1,249	36	3
Tyler	4,995	3,000	712	499	5.5	1,283	38	3
Doddridge	3,932	2,300	478	544	1.6	1,154	36	8
Harrison	31,443	20,508	7,091	615	7.1	3,844	65	3

[a] U.S. Census Bureau, 2013.
[b] Yellowbook, 2016.
[c] Counties with federal lands crossed by the projects.
Note: Inventory of hotels, motels, and campgrounds was collected for only those counties where facilities are located and that the pipeline crosses. Data were not collected for states.

4.9.4 Public Services

A wide range of public services and facilities are offered in the ACP and SHP study area. Services and facilities include hospitals, full-service law enforcement, paid and volunteer fire departments, and schools. Table 4.9.4-1 provides an overview of select public services available by county/city near the study area. All counties and cities within the ACP and SHP study area have at least one police department and one fire department, except for Greensville County, Virginia (ACP study area). At least one hospital is present in 7 of the 8 counties in West Virginia, 6 of the 14 counties and cities in Virginia, 7 of the 8 counties in North Carolina, and all the counties in Pennsylvania within the ACP and SHP study area.

In West Virginia, 32 police departments are located within the study area, with the greatest number in Harrison County and the least in Doddridge and Lewis Counties. The number of local fire departments ranges from 20 in Harrison County to 5 in Tyler County, for a total of 74 within the study area in West Virginia. There are nine hospitals available in the study area in West Virginia, with at least one hospital present in all counties, except for Doddridge. The greatest number of public schools are in Randolph County and the least number in Doddridge County.

In Virginia, 23 police departments are located within the study areas, with the number of police departments ranging from 1 to 3 per county or city. The number of local fire departments ranges from 16 in Augusta County to none in Greensville County, for a total of 77 within the study areas in Virginia. There are 9 hospitals available in the study area in Virginia, however there are no hospitals in 8 of the 14 counties and cities in the study area. The greatest number of public schools are in the City of Chesapeake and the least number in Highland County.

In North Carolina, 50 police departments are located within the study area, with the greatest number in Johnston County and the least in Sampson and Cumberland Counties. The number of local fire departments ranges from 36 in Robeson County to 10 in Northampton County, for a total of 170 within the study area in North Carolina. There are 10 hospitals available in the study area in North Carolina, with at least 1 hospital in all counties except for Northampton County. The greatest number of public schools are in Cumberland County and the least number in Northampton County.

In Pennsylvania, 49 police departments are located within the study area, with all but 3 in Westmoreland County. There are 38 local fire departments in the study area, 22 in Westmorland County and 16 in Greene County. There are 8 hospitals and 106 public schools in the study area in Pennsylvania.

Based on the total number and location of police departments (164) and fire departments (388), public schools (600), and hospitals (38), there appears to be adequate public service infrastructure near the projects to accommodate the temporary needs of the non-local construction workforce and long-term needs of non-local operations and maintenance workers, while not compromising services to residents and tourists. Further, Atlantic and DETI would require each of its contractors to have a health and safety plan, covering location- or work-specific requirements to minimize the potential for on-the-job accidents. Contractors and Atlantic's and DETI's site safety staff would be responsible for monitoring compliance with the plans. In the event of an accident, police, fire, and/or medical services could be necessary; however, the anticipated demand for these services is not expected to exceed existing capabilities in the study area.

TABLE 4.9.4-1

Public Services Available in Atlantic Coast Pipeline and Supply Header Project Study Area

Project/Location	Fire Departments [a, b, c, d]	Nearest Distance to Mainline/ Facility (miles)	Police Departments	Nearest Distance to Mainline/ Facility (miles)	Hospitals [f, g, h, i]	Nearest Distance to Mainline/ Facility (miles)
ATLANTIC COAST PIPELINE						
West Virginia						
Harrison	20	7.8	10	7.8	2	9.3
Lewis	7	0.6	2	3.6	2	5.5
Upshur	8	2.8	3	0.4	1	2.6
Randolph	11	1.1	4	15.8	1	15.6
Pocahontas [j]	6	2.9	3	9.6	1	9.3
Virginia						
Highland [j]	4	1.7	1	14.9	0	23.5
Bath [j]	10	0.7	1	6.8	1	15.4
Augusta [j]	16	2.4	2	3.2	2	4.7
Nelson [j]	7	3.2	1	5.2	0	11.6
Buckingham	4	6.7	1	7.2	0	5.9
Cumberland	3	4.2	1	4.2	0	4.3
Prince Edward	5	5.4	2	5.4	1	5.4
Nottoway	3	4.9	3	2.6	0	2.9
Dinwiddie	6	6.8	1	6.6	0	16.3
Brunswick	7	2.3	2	7.2	0	7.0
Greensville	0	3.4	1	3.6	0	3.1
Southampton	8	1.9	3	2.6	1	2.8
City of Suffolk	5	1.6	2	1.3	2	1.3
City of Chesapeake	1	1.3	2	1.2	2	1.2
North Carolina						
Northampton	10	1.8	5	1.8	0	4.7
Halifax	17	1.7	5	1.7	2	3.5
Nash	20	3.6	7	1.8	2	3.6
Wilson	19	2.9	6	3.4	1	7.7
Johnston	29	2.2	10	1.2	1	2.6
Sampson	19	1.2	4	4.3	1	4.8
Cumberland	20	1.5	4	4.3	2	8.2
Robeson	36	1.3	9	2.0	1	3.1
SUPPLY HEADER PROJECT						
Pennsylvania						
Westmoreland	22	4.3	46	3.1	7	6.6
Greene	16	2.5	3	2.6	1	1.5
West Virginia						
Wetzel	11	1.0	4	7.7	1	10.3
Tyler	5	11.6	4	11.2	1	18.8
Doddridge	6	4.1	2	4.5	0	14.6
Harrison	20	7.8	10	7.8	2	9.3

TABLE 4.9.4-1 (cont'd)						
Public Services Available in Atlantic Coast Pipeline and Supply Header Project Study Area						
Project/Location	Fire Departments [a, b, c, d]	Nearest Distance to Mainline/ Facility (miles)	Police Departments	Nearest Distance to Mainline/ Facility (miles)	Hospitals [f, g, h, i]	Nearest Distance to Mainline/ Facility (miles)

[a] West Virginia Fire and EMS Department Directory, 2015.
[b] Virginia Department of Fire Programs, 2014.
[c] CarolinaFirePage.com, 2015.
[d] USA Fire and Rescue, 2014.
[e] USACOPS, 2013.
[f] West Virginia Department of Military Affairs and Public Safety, 2015.
[g] North Carolina Department of Health and Human Services, 2015.
[h] Hospitals Center, 2014.
[i] Pennsylvania Department of Health, 1999.
[j] Counties with federal lands crossed by the projects.

Temporary increased demand on local public services may occur including the need for local police to direct traffic during construction at road crossings or respond to emergencies associated with pipeline construction. Fire departments may have to respond to project-related fires or other emergencies, and medical services may be necessary for workforce personnel illnesses or injuries. Atlantic and DETI would work with local law enforcement, fire departments, and emergency medical services prior to construction to coordinate for effective emergency response. In addition, Atlantic and DETI would work with local emergency responders and hospitals to coordinate for effective emergency response in remote areas, and would confirm location and availability of airlift services during construction. Construction team leaders would develop tailored emergency response plans with the appropriate emergency response support staff in each of the counties and cities in the study area. The response plans would consider the location-specific construction and operations activities as well as the capabilities and needs of each county and city along the proposed pipeline routes. Wall maps and/or digital shapefiles of the pipeline centerline would be provided to emergency responders in the study area. Additionally, to mitigate the reliance on local medical services for minor first-aid related to on-the-job injuries, Atlantic's and DETI's construction contractors would set up medipods for treatment of minor injuries on site.

It is anticipated that most non-local construction workers would not relocate their families temporarily during the construction period, and as such it is not anticipated ACP and SHP would increase demand for school-related services. As indicated previously, a small number of non-local permanent operations employees (i.e., 82 and 10 for ACP and SHP, respectively), and potentially their families, would relocate to the project area (see table 4.9.2-4). Due to the small number of permanent employees relative to the existing population, we conclude there would not be significant increased demand for school-related services resulting from non-local operations employees relocating to the project area.

Constructing ACP and SHP would not significantly affect public services in the affected counties or communities due to the short duration of each construction phase and the large area over which the workforce would be dispersed. The communities in the project vicinity presently have and are presumed to continue to have adequate infrastructure and services to meet the potential needs of non-local workers who enter the area temporarily.

We received several comments about the safety of a high-pressure pipeline in or near population centers and/or near schools and child daycare and elderly facilities. As further discussed in section 4.12, Atlantic and DETI would construct, operate, maintain, and inspect the proposed facilities to meet or exceed DOT's PHMSA's safety requirements, which have pipeline design requirements that are dependent on the population levels and facilities crossed.

We received several comments from residents expressing concerns about the costs and ability for emergency public services to respond in the event of an accident along the pipeline route or at any project facilities. As discussed in section 4.12, a catastrophic accident is unlikely based on statistical data. Atlantic and DETI would develop, maintain, and implement emergency response plans as required by applicable DOT regulations. Atlantic and DETI would also communicate regularly with the emergency response personnel regarding pipeline safety and emergency response plans.

4.9.5 Tourism

Tourism opportunities in the ACP and SHP study area include federal, state, and local special interest areas. Federal areas in the study area include National Forests, national scenic and recreational trails, WMAs, and a National Scenic Byway. These areas are discussed in more detail in section 4.9.10. In addition, there are many state/commonwealth parks, Civil War historical sites, and private recreation and special interest areas in or near the project area. Recreation and special interest areas are discussed in detail in section 4.8.5.

Tourism opportunities in the ACP and SHP study area are largely associated with outdoor recreational opportunities, and tourist attractions and general recreation areas are located throughout the study area. Travel-related spending supports local economies in the study area, and there are businesses in and around the study area that are dependent on year-round as well as seasonal tourists.

Travel-related spending in the West Virginia counties in the ACP and SHP study area totaled approximately $392 million in 2012, and 4,550 jobs in the West Virginia portion of the study area were attributed to travel-generated employment. Travel-related spending in the Virginia, North Carolina, and Pennsylvania counties and cities in the ACP and SHP study area totaled approximately $3.2 billion in 2013, and over 27,000 jobs in this portion of the study area were attributed to travel-generated employment. Table 4.9.5-1 provides an overview of the economic impacts of travel-related spending in the counties and cities in the ACP and SHP study area.

Travel-related spending in West Virginia in 2012 totaled more than $5.1 billion. Travel-related spending totaled $392.4 million and created approximately 4,550 jobs (approximately 6 percent of the total workforce in the eight counties) in the West Virginia counties in the study area.

In 2013, travel-related spending in Virginia totaled $21.5 billion in 2013. Travel-related spending totaled $1.06 billion and created over 9,400 in the 14 counties and cities in Virginia in the study area.

In North Carolina in 2013, travel-related spending totaled $21.2 billion. Travel-related spending in the North Carolina counties in the ACP study area totaled $1.31 billion and created over 11,400 jobs.

Travel-related spending in Pennsylvania totaled $15.3 billion in 2013. Travel-related spending totaled $834.1 million and created over 6,200 jobs in the Pennsylvania counties in the study area.

While visits to the recreational and special interest areas in the ACP and SHP study area occur year-round, tourism season is generally considered to be from late March through October, with peak season typically from between Memorial Day (late May) through Labor Day (early September), with additional peaks in the spring for blooming season and in mid-October around fall foliage season.

TABLE 4.9.5-1

Economic Impact of Travel in the Atlantic Coast Pipeline and Supply Header Project Study Area: Spending, Earnings, and Employment

Location	Travel Spending ($ million)	Travel Earnings ($ million)	Total Travel Tax Receipts [a] ($ million)	Travel-Generated Employment
West Virginia [b]	**5,103.0**	**1,075.0**	**637.0**	**46,400**
Harrison	142.2	37.2	11.1	1,530
Lewis	47.3	12.1	3.7	530
Upshur	34.4	8.8	2.4	410
Randolph	48.3	12.5	3.6	650
Pocahontas [f]	79.6	21.3	6.3	1,040
Wetzel	27.5	4.7	2.1	260
Tyler	6.4	1.3	0.57	80
Doddridge	6.7	1.2	0.5	50
Virginia [c]	**21,500.0**	**4,900.0**	**1,300.0**	**212,995**
Highland [f]	16.6	3.3	1.3	175
Bath [f]	250.7	30.3	10.5	1,670
Augusta [f]	110.1	19.2	8.5	1,008
Nelson [f]	180.2	31.1	13.2	1,617
Buckingham	11.3	2.3	0.9	119
Cumberland	5.5	1.0	0.4	54
Prince Edward	19.8	4.0	1.2	214
Nottoway	12.6	2.4	1.0	125
Dinwiddie	13.0	2.7	0.9	133
Brunswick	36.4	7.5	2.4	420
Greensville	15.7	2.5	1.0	128
Southampton	14.5	2.9	1.0	148
Suffolk	64.9	10.0	3.7	531
Chesapeake	312.9	57.2	24.7	3,059
North Carolina [d]	**21,200.0**	**4,600.0**	**1,600.0**	**206,700**
Northampton	13.1	1.5	1.65	50
Halifax	84.3	9.8	7.1	510
Nash	257.7	31.1	20.1	2,830
Wilson	104.0	14.8	7.9	800
Johnston	204.5	30.4	16.2	1,660
Sampson	46.1	5.8	3.9	280
Cumberland	472.0	84.9	34.5	4,220
Robeson	127.6	18.5	9.7	1,050
Pennsylvania [e]	**15,316**	**10,568.8**	**4,123.6**	**304,155**
Westmoreland	742.3	131.3	38.3	5,723
Greene	91.8	11.1	4.3	486

[a] Total travel tax receipts include both local and state travel-related tax receipts.
[b] Dean Runyan and Associates, 2012.
[c] U.S. Travel Association, 2014a.
[d] U.S. Travel Association, 2014b.
[e] Tourism Economics, 2015.
[f] Counties with federal lands crossed by the projects.

The influx of construction workers would be limited to the time of construction and dispersed across the ACP and SHP study area throughout the construction period. The demand for temporary housing by non-local workers is not expected to exceed the available number of hotels, motels, and campground units in the study area, but accommodations in the study area could experience some minor limited availability, particularly during planned construction periods in the late-spring through the fall of 2017 and 2018, which is peak tourism season in the project area. These strains would be most likely experienced in the counties of Pocahontas, West Virginia and Highland, Bath, Augusta, and Nelson Counties, Virginia where there are many federal, state, and private recreation and special interest areas; however, sufficient temporary housing accommodations exist in these counties, the project area, and in the metropolitan statistical areas in a 50-mile radius of project facilities. Section 4.9.3 discusses impacts on housing (including hotel/motel/campground rentals).

We received comments regarding potential negative effects on natural resources and the environment from construction and operation of ACP and SHP, and that such effects would negatively affect tourism in the study area. Commenters expressed concerns that project-related environmental impacts would destroy species habitat and either kill off or displace species of interest to fishermen, hunters, and tourists that come to the project area for these recreational activities. We also received comments regarding the potential for negative effects on recreation, aesthetic, and visual resources, and that such efforts would also negatively affect tourism in the project area. As discussed in sections 4.3.2, 4.4, 4.5, and 4.6, we conclude that implementation of Atlantic's and DETI's construction plans at waterbody crossings and restoration and revegetation measures along the construction right-of-way would reduce impacts on water quality, vegetation, wildlife, and aquatic resources, respectively. As discussed in section 4.8.5, short-term temporary hunting impacts may occur during construction and restoration of the projects; however, these would not represent a significant impact because the areas outside of the construction workspace would remain available for hunting. Following construction, access to available hunting areas would be allowed to resume and operation of the projects would not affect future hunting activities. As discussed in section 4.8.8, in most land uses, ACP and SHP would not result in significant or long-term visual impacts because the pipeline would be installed below ground and the right-of-way and ATWS would be restored and revegetated after construction in accordance with Atlantic's and DETI's *Restoration and Rehabilitation Plan*.

We received comments expressing concern that the tourism economy in the Rockfish Valley and Wintergreen area in Nelson County, Virginia would be negatively impacted by construction and operation of the projects. The Rockfish Valley and Wintergreen area includes Spruce Creek Park, Wintergreen Country Store, Elk Hill Baptist Church, Nelson Scenic Loop Trail, the Rockfish Valley Kite Festival Grounds, Wintergreen Resort, along with several wineries, microbreweries, and resort areas. Commenters expressed concern that ACP would adversely affect environmental resources; reduce food, shelter, and habitat for wildlife; and diminish enjoyment of the trail for visitors, thereby affecting the tourism economy in the area.

We received comments on the draft EIS expressing concern that the tourism economy in Pocahontas County, West Virginia would be negatively impacted by construction and operation of the projects. Pocahontas County includes the MNF, the Greenbrier River and the River Rail-Trail, Seneca State Forest, the Allegheny Trail, and Snowshoe Resort, along with other recreational areas. Commenters expressed concern that ACP would adversely affect environmental resources and diminish enjoyment of the area for visitors, thereby affecting the tourism economy in the area.

Scenic travelers and tourists to Rockfish Valley and Pocahontas County would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with construction workspaces. Atlantic would coordinate with Rockfish Valley, Wintergreen, and Pocahontas area businesses and recreational stewards to inform them of construction schedules and traffic volumes and would, to the extent practicable, schedule construction activities to avoid conflicts with special events. We have found no evidence that short-term effects of pipeline construction have long-term significant impacts on the tourism industry in areas where pipeline construction has occurred. As such, we conclude recreational uses and tourism activities in the project area would not be affected by operation of the project. Additional discussion regarding impacts on waterbodies and wetlands, vegetation, wildlife, and aquatic resources in the Rockfish Valley area and Pocahontas County is provided in sections 4.3.2, 4.3.3, 4.4, 4.5, and 4.6, respectively; discussion of recreation and special interest areas is provided in section 4.8.5; and discussion of historic and archaeological sites and the South Fork Valley Rural Historic District, including Elk Hill Farm, is provided in section 4.10.1.1.

We received comments that construction and operation of ACP would affect the peaceful and serene environment at the Satchidananda Ashram and Light of Truth Universal Shrine at Yogaville, located in Buckingham County, Virginia. Yogaville is over 4 miles from the proposed Compressor Station 2; and the Light of Truth Universal Shrine at Yogaville is 1 mile from the proposed ACP route alignment and over 1 mile from the nearest proposed HDD location. We believe that the project locations are sufficiently distant from the Yogaville properties so that people enjoying the peaceful and serene environment would not be disturbed by project construction or operation. Therefore, we conclude no direct or indirect impacts on tourism and visitation to Yogaville would result from construction and operation of the projects.

Though ACP would cross linear trails where a detour or temporary closure may be required, Atlantic has proposed general mitigation measures and committed to developing site-specific crossing plans in consultation with the applicable land-managing agency. The ANST, one of such trails to be crossed by the project, offers backcountry recreation and hiking opportunities and is visited by over 2.5 million people annually (NPS, 2016h). Based on the impacts identified and Atlantic's proposed measures to reduce impacts, we conclude the project would not result in significant or adverse impacts on recreational or special interest areas. As such, and given the relative short timeframe for construction, we conclude the projects would not result in significant or adverse long-term impacts on tourism.

4.9.6 Transportation and Traffic

The local roads and highway systems near ACP and SHP are primarily easily accessed by interstate highways, U.S. Highways, state highways, secondary state highways, country roads, and private roads. ACP and SHP may temporarily impact transportation and traffic during construction across and within roadways and railroads and from an increase in vehicle traffic associated with the commuting of the construction workforce to the project area and the movement of construction vehicles and delivery of equipment and materials to the construction work areas.

Atlantic and DETI estimate a total of 125 to 150 vehicle trips per day for Spreads 1 through 5, and 90 to 115 vehicle trips per day for Spreads 6 through 13. It is further estimated that there would be approximately 325 to 400 vehicles total used to construct each pipeline spread. Estimated trips and vehicle numbers include commuter trips and vehicles along with delivery trucks for the delivery of equipment, pipe, and other materials to the construction areas. Atlantic and DETI anticipate busing crews to work areas from contractor yards or other predetermined locations and anticipate some ridesharing among inspection and other crews, thereby reducing passenger vehicle traffic on local roads. Vehicle use by construction personnel would primarily take place in the early morning and late evening (i.e., just prior to and just after construction hours). During construction, vehicles would be distributed across the ACP and SHP area. See table 4.9.6-1 for average daily traffic counts on the major roads in the ACP and SHP area.

Construction activities in the ACP and SHP study area would result in temporary effects on local transportation infrastructure and vehicle traffic, including disruptions from increased transportation of construction equipment, materials, and workforce; disruptions from construction of pipeline facilities at or across existing roads; and damage to local roads caused by heavy machinery and materials.

TABLE 4.9.6-1

Primary Transportation Routes and Annual Daily Traffic Counts for the Atlantic Coast Pipeline and Supply Header Project

Project/Location	Spread	Primary Routes	Annual Average Daily Traffic [a, b, c, d, e]
ATLANTIC COAST PIPELINE			
West Virginia			
Harrison	Spread 1 (AP-1)	Hwy 19	1,933
		I-79	51,938
		Hwy 33	4,459
Lewis	Spread 1(AP-1)	Hwy 19	2,356
		I-79	27,360
		Hwy 33	14,903
Upshur	Spread 1 and 2 (AP-1)	Hwy 19	4,459
		I-79	18,744
		Hwy 33	3,949
		Hwy 20/11	5,046
		Hwy 250	4,360
Randolph	Spread 2a and 3 (AP-1)	Hwy 20/11	5.046
		Hwy 250	5,019
		US 219	1,691
Pocahontas [f]	Spread 3 and 3a (AP-1)	Hwy 250	1,814
		WV 28	1,399
		WV 92	469
Virginia			
Highland [f]	Spread 3a and 4 (AP-1)	Hwy 250	1,000
Bath [f]	Spread 4 (AP-1)	Hwy 220	2,400
Augusta [f]	Spread 4 and 5 (AP-1)	Hwy 250	2,500
		I-64	18,000
		Hwy 29	13,000
Nelson [f]	Spread 5 and 6 (AP-1)	Hwy 250	7,800
		I-64	18,000
		Hwy 29	16,000
		Hwy 151	9,100
		Hwy 6	4,500
Buckingham	Spread 6 (AP-1)	Hwy 15	8,400
		Hwy 360	5,600
Cumberland	Spread 6 (AP-1)	Hwy 15	3,800
		Hwy 360	3,600
Prince Edward	Spread 6 (AP-1)	Hwy 15	9,600
		Hwy 360	4,800
Nottoway	Spread 6 and 7 (AP-1)	Hwy 15	9,600
		Hwy 360	5,000
Dinwiddie	Spread 7 (AP-1)	Hwy 15	9,600
		Hwy 360	5,700
Brunswick	Spread 7 and 12 (AP-1; AP-4)	Hwy 15	4,400
		Hwy 360	6,300
Greensville	Spread 7 and 12 (AP-1; AP-5)	Hwy 15	4,400
		Hwy 360	4,800
Southampton	Spread 11(AP-3)	Hwy 58	18,000
Suffolk, City of	Spread 11 (AP-3)	Hwy 58	27,000

TABLE 4.9.6-1 (cont'd)			
Primary Transportation Routes and Annual Daily Traffic Counts for the Atlantic Coast Pipeline and Supply Header Project			
Project/Location	Spread	Primary Routes	Annual Average Daily Traffic [a, b, c, d, e]
Chesapeake, City of	Spread 11 (AP-3)	Hwy 13	30,000
North Carolina			
Northampton	Spread 7 and 8 (AP-1; AP-2)	Hwy 301	1,360
		I-95	33,000
Halifax	Spread 8 (AP-2)	I-95	36,000
Nash	Spread 8 and 9 (AP-2)	I-95	38,000
Wilson	Spread 9 (AP-2)	I-95	39,000
Johnston	Spread 9 (AP-2)	I-95	23,000
Sampson	Spread 9 (AP-2)	I-95	21,000
Cumberland	Spread 9 and 10 (AP-2)	I-95	25,000
Robeson	Spread 10 (AP-2)	I-95	18,000
SUPPLY HEADER PROJECT			
Pennsylvania			
Westmoreland	Spread 14 (TL-636)	I-76	34,000
		Hwy 22	16,000
Greene	Spread 14 (TL-636)	I-79	33,000
West Virginia			
Wetzel	Spread 13 (TL-635)	Hwy 20	1,827
Tyler	Spread 13 (TL-635)	Hwy 20	5,566
Doddridge	Spread 13 (TL-635)	Hwy 23	1,362
		Hwy 50	16,302
Harrison	Spread 13 (TL-635)	Hwy 19	5,974

[a] Annual Average Daily Traffic counts taken from the nearest road segment.
[b] WVDOT, 2013.
[c] VDOT, 2014.
[d] NCDOT, 2014
[e] Pennsylvania Department of Transportation, 2016.
[f] Counties with federal lands crossed by the projects.

Public roads used to travel to and from workspaces by construction vehicles could experience increased sediment tracking/build-up and surface damage. FS roads would be properly constructed and/or maintained so that road damage does not occur during the duration of use. Therefore, FS roads should not experience increased sediment tracking or build-up or surface damage, and any damaged roads would be repaired to preconstruction conditions. Paved roads are the most durable and generally can withstand periodic surges in traffic and heavy use; unpaved roads, however, are much less durable. Atlantic and DETI would coordinate with appropriate transportation authorities to assess the need for road repair after construction of the projects. In addition, Atlantic and DETI would repair any damages to roadway surfaces as required in the FERC *Plan* (section IV.E.3).

Atlantic and DETI would utilize up-to-date traffic information for each construction spread to identify measures to minimize short-term impacts on roads in the ACP and SHP project area. Most states fund road repairs with motor fuel taxes, motor vehicle registration fees, and compensatory fees paid by commercial carriers. Commercial carriers need registrations to operate in each state and may need special permits for oversize and overweight vehicles, temporary trip permits within the state, or to haul hazardous materials. Atlantic and DETI would coordinate with state and local departments of transportation and land-managing agencies to obtain the required permits to operate trucks on public roads. Atlantic and DETI would also coordinate with landowners and tenants in the areas where local, private roadways may be impacted during construction.

To minimize and mitigate potential impacts, Atlantic and DETI would prepare spread-specific traffic and transportation management plans for managing vehicle traffic during construction of the projects – considering peak travel times, emergency services, and residential traffic. To further minimize and mitigate potential impacts, Atlantic and DETI would limit construction activities to between 6:00 a.m. and 6:00 p.m., to the extent practicable; therefore, workers would travel to and from the site earlier and later in the day, outside of peak traffic hours, and thus minimizing their contribution to traffic congestion.

ACP and SHP would cross most paved roads, highways, and railroads via conventional subsurface bore (described in section 2.3.3.8), resulting in little to no disruption to traffic or road impacts. Smaller roads would be crossed using the open-cut method, usually requiring temporary road closures and/or detours. Where detours are infeasible, crews would leave at least one road lane open to maintain traffic flow, except when installing the pipeline, and use necessary signage and traffic control measures to ensure continued traffic flow during construction. Most open-cut crossings are resurfaced after a few days of completion. Atlantic and DETI would coordinate with local police departments in areas of high traffic volume to avoid traffic flow interruptions and ensure the safety of pedestrians and vehicles and passing emergency vehicles. Traffic control measures, such as flagmen and signs, would be employed as necessary to ensure safety of local traffic. Additionally, Atlantic and DETI would be responsible for restoring roads in accordance with permit conditions and as requested by landowners or agencies, and would periodically inspect roads near crossings and make repairs as necessary to damages caused by construction activities.

In a supplemental filing dated May 1, 2017, Atlantic confirmed that it has met with the VDOT to address the concerns raised in VDOT's filed comments (Accession Number 20170306-5044). Atlantic has stated that it discussed the conditions set forth by the VDOT and have affirmed Atlantic's commitment to abide by VDOT's conditions.

We received several comments on the draft EIS regarding traffic impacts on existing narrow, single-lane, unpaved roads that have been identified by Atlantic as access roads for use during construction in areas of West Virginia and Virginia. Commenters are concerned that added construction traffic (e.g., worker trips and large equipment and material delivery) would cause dangerous conditions and extensive damage. We acknowledge there may be temporary construction impacts on residences and businesses along these more narrow, rural access roads. Impacts may include inconveniences caused by noise and dust; disruption of access to homes and businesses; and traffic congestion. As mentioned previously, Atlantic and DETI would prepare spread-specific traffic and transportation management plans for managing vehicle traffic during construction of the projects to mitigate and minimize impacts.

As a result of measures and methods described in this section, we anticipate that construction activities related to ACP and SHP would result in minor and temporary to short-term impacts on transportation infrastructure.

4.9.7 Property Value and Insurance

We received numerous comments regarding the potential negative effects of ACP and SHP on property values and home insurance. Specific issues presented include devaluation of properties along and adjacent to the proposed pipeline route and project facilities, and the inability to obtain home insurance or being charged higher premiums when renewing existing policies.

An economic impact study conducted by Key-Log Economics, "*Economic Costs of the Atlantic Coast Pipeline: Effects on Property Value, Ecosystem Services, and Economic Development in Western* *and Central Virginia"* (Phillips et al., 2016), analyzed the economic impact of ACP on a four-county region in western and central Virginia (Highland, Augusta, Nelson, and Buckingham Counties). The study claimed that 521 parcels in four-county region would be within the ACP right-of-way with a current total value of $277.1 million. The study cites landowners and realtors who report buyers backing out of contracts as well as notice of a general loss of interest in potentially affected properties along the proposed route of ACP (Phillips et al., 2016). Though the study presents anecdotal evidence regarding sale value of properties, unfortunately, it does not present sources for the data presented with regard to loss of property value due to proximity to a pipeline.

The Key-Log study cited an opinion survey taken of real estate agents in Wisconsin that found that 68 percent of the respondents questioned believed the presence of a pipeline on a parcel would decrease its value between 5 and 10 percent. About 70 percent of the realtors queried in that survey believed it would take longer to sell a property with a pipeline on it, then a parcel without a pipeline. Another public opinion poll in Wisconsin found that 58.9 percent of prospective property buyers would not purchase land with a pipeline on it, while 18.7 percent would only buy land encumbered by a pipeline at a reduced price (Kielisch, 2015). The responses to these polls were strictly personal opinion and not based on real estate sales data. Also, questionnaires and surveys, while providing a snapshot of public opinion, do not carry with them the rigors of statistically developed and controlled studies.

The FERC staff conducted its own independent research and found multiple studies that examined the effects of pipeline easements on sales and property values, and evaluated the impact of natural gas pipelines on real estate. One such study examined the affect a pipeline accident had on nearby property values. The study analyzed the impact that a June 1999 Bellingham, Washington gasoline pipeline explosion had on sales of real estate on or near the pipeline after the accident. The study, which considered proximity and persistence over time, found that prior to the accident there was no significant effect on property values due to proximity of the pipeline. However, immediately after the accident the study found that houses adjacent to the pipeline sold for $13,000 less than houses further away. However, over time the discount reduced back to pre-incident levels (Hansen et al., 2006).

Other studies analyzed by the FERC staff examined the impact the presence of a natural gas pipeline had on residential property values where no accidents had occurred. In 2001, the INGAA sponsored a national study to determine if the presence of a pipeline affected property values or sales prices. The study employed paired sales, descriptive statistics, and linear regression analysis to assess impacts on four separate, geographically diverse case study areas. The study found that having a pipeline on the property did not significantly alter sales prices. The size of the pipeline (diameter) had no significant impact on home prices. The study concluded that the presence of a pipeline did not impede the development of surrounding properties (Allen, Williford and Seale, Inc., 2001).

Studies conducted in 2008 by PGP Valuation Inc. (PGP) (PGP, 2008) for Palomar Gas Transmission, Inc. and by Ecowest for the Oregon LNG Project reached similar conclusions. Both studies evaluated the potential effect on property values of a natural gas pipeline that was constructed in 2003/2004 in northwestern Oregon, including along the western edge of the Portland metro area. The PGP study found that:

- there was no measurable long-term impact on property values resulting from natural gas pipelines for the particular pipeline project studied;
- interviews with buyers and brokers indicated no measurable impact on value or price; and
- there was no trend in the data to suggest an extension of marketing periods (i.e., time while the property is on sale) for properties with natural gas pipeline easements.

The Ecowest study concluded that the pipeline had no statistically significant or economically significant impact on residential properties. The study also concluded that there was no relationship between proximity to the pipeline and sale price (Fruits, 2008).

One study, *"The Effect of Pipelines on Residential Value"* (Diskin et al., 2011), looked at the effects of natural gas transmission pipelines on residential values in Arizona. The study concluded that there was no identifiable systemic relationship between proximity to a pipeline and residential sale price or value.

Another study, *"Pipeline Impact Study: Study of a Williams Natural Gas Pipeline on Residential Real Estate: Saddle Ridge Subdivision, Dallas Township, Luzerne County, Pennsylvania"* prepared by the firm of Allen, Williford and Seale, Inc., assessed the impact on the sale price of undeveloped lots and single-family residences that have a natural gas transmission line easement on the property (Allen, Williford and Seale, Inc., 2014). The report compared units in a subdivision in Luzerne County that had an existing natural gas transmission line located within it. Differences between the sale prices of undeveloped lots and houses with the pipeline easement and those that did not have an easement were analyzed. The report found that, when the sales prices of the encumbered residences were compared with the sales prices of the unencumbered residences, there was no indication that the pipeline easement had any effect on the sales prices of homes in Saddle Ridge. Likewise, when the sales prices of encumbered lots were compared with the sales prices of unencumbered lots, the differential in price could be explained by the reduction in lot size associated with the easement area.

For our analysis of the Constitution Pipeline and Wright Interconnect Projects (Docket Nos. CP13-499-000 and CP13-502-000), in Pennsylvania and New York, several appraisers were contacted about the potential impacts on property values due to the presence of a natural gas pipeline (FERC, 2014). One appraiser who teaches seminars for appraisers and realtors, including discussions of mineral rights and pipeline easements, provided information on the subject. According to the appraiser, "the empirical evidence indicates no difference in value attributable to the existence of the pipeline easement." The appraiser further noted that he was not aware of appraisers adjusting the appraiser reports for the existence of a pipeline easement. He stated that the large number of variables that impact home values make it difficult to determine the incremental effect that any one variable may have on a home's value. Regardless, it is possible that the perceived safety issues or the limitations on land use within the permanent easement could reduce the number of potential buyers for a property, which may extend the number of days a property is on the market.

In 2016, INGAA released a study conducted by Integra Reality Resources (IRR) that analyzed the impacts on property values from several FERC-jurisdictional natural gas transmission lines sited throughout the country. Case studies were analyzed from Ohio, Virginia, New Jersey, Pennsylvania, and Mississippi. The investigation focused on single-family homes and townhomes, and looked at sales prices over several years. In all case studies, sale prices were adjusted for square footage, and a linear regression model was run to determine correlations between home prices and proximity to pipeline easements. IRR found there were no statistically significant differences between prices paid within a same subdivision for houses located adjacent to a pipeline easement and houses farther away (IRR, 2016).

FERC staff also examined the impact the presence of a natural gas compressor station had on residential property values. Staff identified two recent studies that assessed the effects of natural gas pipeline compressor stations on property values. The first study was prepared for the National Fuel Gas Supply Corporation and assesses the impacts on property values in neighborhoods surrounding compressor stations in seven locations in New York state. Sales data over the previous 15 years were evaluated, and assessors from six of the seven areas were interviewed. The study found no quantifiable evidence of a discernable effect on property values or appreciation rates of properties within 0.5 mile of compressor stations. The study, which notes the general lack of sales data for analysis, identified the following commonalities among the seven areas: the compressor stations were sited on large land parcels and set back from the road; natural and constructed buffers were utilized; and compressor station sites were generally in rural areas removed from higher density development (Griebner, 2015)

The second study, "A Study of Natural Gas Compressor Stations and Residential Property Values," prepared for Tennessee Gas Pipeline Company, L.L.C., was based on four case studies in New Hampshire and Massachusetts, compared the value of properties close to compressor stations to properties located farther away. The study relied on available market data and interviews with town assessors, building department representatives, and other government representatives. The study concluded that the presence of a compressor station did not generally affect property values in the area. The study indicated a higher confidence in this conclusion for properties more than 0.5 mile from compressor stations. The reason for this is that the areas surrounding the compressor stations in each of the case studies were more rural in nature and, therefore, there was a comparative lack of sales data in the immediate vicinity of the compressor stations as compared to the area 0.5 mile away. Overall, the study concluded that "well designed and operated compressor stations located on larger sites with adequate buffers should have minimal impact on surround land uses and residential property values" (Foster, 2016).

We recognize the studies cited above do not necessarily have a one to one applicability to all areas crossed by ACP and SHP. Most of studies that analyze the effects of pipeline easements on sales and property values have been conducted in areas with higher residential density than is found along much of the ACP and SHP project routes. The above-mentioned studies are an adequate backdrop to analyze potential impacts on property values in areas with larger populations and densities along the project routes (i.e., Harrison County, West Virginia; the Cities of Suffolk and Chesapeake, Virginia; Wilson, Johnston, and Cumberland Counties, North Carolina; and Westmoreland County, Pennsylvania). However, these findings may not be comparable when analyzing impacts on properties along pipeline rights-of-way in rural areas. This may be particularly true when analyzing large acreage parcels that may have a land use value attached to the overall value of the property, in addition to the value of the land and any structures present. We acknowledge that it is reasonable to expect that property values may be impacted differently based on the setting and inherent characteristics of the property.

Based on the research we have reviewed, however, we find no conclusive evidence indicating that natural gas pipeline easements or compressor stations would have a significant negative impact on property values, although this is not to say that any one property may or may not experience an impact on property value for either the short or long term.

We also received several comments expressing concern for potential insurance premium and mortgage rate adjustments based on pipeline proximity. Regarding the potential for insurance premium adjustments associated with pipeline proximity, insurance advisors consulted on other natural gas projects reviewed by the FERC indicated that pipeline infrastructure does not affect homeowner insurance rates (FERC, 2008). As such, we find that homeowners' insurance rates are unlikely to change due to construction and operation of the proposed ACP and SHP. Similarly, regarding the potential impacts on mortgage rates associated with pipeline proximity, our research has not found any practice by mortgage companies to re-categorize properties, nor are we aware of federally insured mortgages being revoked based on proximity to pipelines.

4.9.8 Economy and Tax Revenues

During scoping, several commenters voiced concerns regarding the negative economic effects of ACP on local areas. We also heard from many commenters who voiced concern that the economic impact studies provided by Atlantic overstated the economic impacts of the projects while ignoring any negative impacts that may occur.

Dominion Resources Services, Inc. (on behalf of Atlantic and DETI) commissioned two economic impact studies to assess the economic impact of construction and operation of ACP.[25] The first study, *The Economic Impact of the Atlantic Coast Pipeline in West Virginia, Virginia, and North Carolina*, was completed by Chmura Economics and Analytics in September, 2014.[26] The scope of the Chmura analysis covered the impacts of the construction and operation of ACP at a state level in the three-state/ commonwealth region of West Virginia, Virginia, and North Carolina.

Construction of ACP would have a beneficial, short-term impact on employment, local goods and service providers, and state governments in the form of sales tax revenues. Table 4.9.8-1 identifies the one-time direct,[27] indirect,[28] and induced[29] economic effects that construction of ACP would have on West Virginia, Virginia, and North Carolina.

TABLE 4.9.8-1

One-Time Economic Effects of Construction of the Atlantic Coast Pipeline on the Three-State/Commonwealth Region (Estimated Totals from 2014-2019) [a]

Economic Indicator	West Virginia	Virginia	North Carolina	Total for the Three-State/ Commonwealth Region
Employment [b]				
Direct	1,796	4,965	2,582	9,343
Indirect	531	1,602	812	3,380
Induced	767	2,207	1,032	4,517
Total	3,093	8,774	4,426	17,240
Spending ($ Million) [b]				
Direct	$295.9	$841.3	$409.7	$1,546.9
Indirect	$84.0	$266.1	$128.9	$551.7
Induced	$98.8	$311.5	$141.6	$639.3
Total	$478.7	$1,418.9	$680.2	$2,737.9
Tax Revenue to State Government ($ Million) [b]				
Individual Income Tax	$3.8	$14.1	$6.1	$24.0
Corporate Income Tax	$0.152	$0.528	$0.317	$0.997
Total	$4.0	$14.6	$6.4	$25.0

[a] Chmura, 2014.
[b] Numbers may not sum due to rounding.

Payroll taxes would be collected from workers employed on ACP, resulting in additional beneficial, short-term effects. Atlantic estimates that payroll spending would be approximately $1.5 billion during the

[25] Neither of the two commissioned economic analyses included county or city level analysis of impacts, nor did either study analyze economic impacts of SHP.

[26] In the final Resource Report 5, Atlantic and DETI submitted updated construction workforce and payroll numbers in the text of the resource report. Neither economic impact study was updated; therefore, the numbers presented in this section directly related to the economic impact studies do not match exactly with numbers presented in other subsections of Section 4.9. Given the relatively small difference in overall numbers, we decided that the economic impact studies were still relevant in so far as they show general impacts.

[27] Direct effects are the initial economic changes resulting from the activity or policy that takes place associated with the industry immediately affected.

[28] Indirect effects are secondary economic changes associated with the purchase of materials and supplies and services for production of ACP.

[29] Induced effects are economic changes associated with the disposable income that new workers with the ACP and linked businesses spend on household goods and services.

construction phase (of which, it is anticipated that $750 million would go to the local construction workforce) and an estimated total annual payroll of $41.3 million during operation. Atlantic estimates that approximately 13.6 percent of the total dollar amount of materials purchased would be spent on locally purchased materials in the three-state/commonwealth region.

Table 4.9.8-2 presents the estimated annual economic effects of ACP on the three-state/ commonwealth region during operation.

TABLE 4.9.8-2

Annual Economic Effects of Operation of the Atlantic Coast Pipeline on the Three-State/Commonwealth Region [a]

Economic Indicator	West Virginia	Virginia	North Carolina	Total for the Three-State/ Commonwealth Region
Employment [b]				
Direct	24	39	18	82
Indirect	26	42	18	99
Induced	24	37	16	90
Total	74	118	52	271
Spending ($ Million) [b]				
Direct	$9.4	$24.3	$7.6	$41.3
Indirect	$3.8	$7.6	$2.2	$15.3
Induced	$2.4	$5.9	$1.9	$12.6
Total	$15.6	$37.8	$11.7	$69.2
Annual Tax Revenue to State Government [c]				
Individual Income Tax	$113,678	$233,027	$71,838	$418,443

a Chmura, 2014.
b Numbers may not sum due to rounding.
c Corporate income tax paid by ACP to the three-state governments was not included in the Chmura analysis.

A second study, *The Economic Impacts of the Atlantic Coast Pipeline*, conducted by ICF International (ICF, 2015) assessed anticipated effects of ACP on natural gas and electricity prices as well as economic impacts on the project area. The study, which measured the net effect of energy cost savings to homes and businesses due to increased access to natural gas supplies, concluded that from years 2019 to 2038, operation of ACP could result in a net annual average energy cost savings of $377 million for natural gas and electricity consumers in Virginia and North Carolina. Additionally, the study found that the energy cost savings (due to increased supply of low-cost energy sources) could allow consumers and businesses to spend money in other parts of the economy, leading to the creation of new jobs, labor income, tax revenues, and gross domestic product.

Though an economic impact assessment was not completed specifically for SHP, it can be reasonably expected that the construction and operation of SHP would result in proportionally similar economic benefits as those of ACP in the form of increased payroll, tax revenue, purchase of local materials, and use of local vendors and businesses. DETI estimates that approximately $92 million would be spent in the SHP project area in the form of payroll to workers, and approximately $40 million (out of a total $110.1 million) would be spend in local material purchases.

Additionally, local communities in the project area would benefit from the annual property taxes that would be paid by Atlantic and DETI over the life of the projects. Table 4.9.8-3 provides the estimated annual property taxes to be paid through 2025.

TABLE 4.9.8-3

Estimated Annual Property Taxes by County/City for the Atlantic Coast Pipeline and Supply Header Project [a]

Project/Location	Estimated Property Taxes (2019)	Estimated Property Taxes (2025)	Estimated Total Taxes (2018 to 2025)
ATLANTIC COAST PIPELINE			
West Virginia			
Harrison	$30,066	$306,057	$1,889,270
Lewis	$296,286	$3,279,753	$20,219,778
Upshur	$175,622	$1,861,206	$11,481,876
Randolph	$238,669	$2,542,408	$15,683,011
Pocahontas	$152,551	$1,616,703	$9,973,526
Virginia			
Highland	$50,540	$270,916	$1,661,555
Bath	$125,667	$673,634	$4,131,461
Augusta	$369,807	$1,982,345	$12,157,901
Nelson	$234,519	$1,257,135	$7,710,121
Buckingham	$266,779	$1,430,062	$8,776,410
Cumberland	$80,951	$433,935	$2,661,366
Prince Edward	$29,209	$156,572	$960,269
Nottoway	$133,684	$716,608	$4,395,022
Dinwiddie	$110,484	$592,245	$3,632,295
Brunswick	$141,779	$760,006	$4,659,655
Greensville	$152,985	$820,072	$5,026,219
Southampton	$119,520	$640,686	$3,929,384
Suffolk, City of	$195,715	$1,049,126	$6,434,388
Chesapeake, City of	$80,211	$429,969	$2,633,865
North Carolina			
Northampton	$1,164,990	$1,993,990	$12,541,402
Halifax	$542,337	$928,008	$5,906,696
Nash	$711,671	$1,217,759	$7,750,941
Wilson	$289,257	$494,955	$3,150,350
Johnston	$1,020,271	$1,749,188	$11,130,677
Sampson	$203,882	$348,867	$2,220,513
Cumberland	$957,478	$1,638,904	$10,423,256
Robeson	$633,332	$1,084,822	$6,902,862
TOTAL	**$8,508,260**	**$30,275,934**	**$188,044,069**
SUPPLY HEADER PROJECT			
Pennsylvania [b]			
Westmoreland	NA	NA	NA
Greene	NA	NA	NA
West Virginia			
Wetzel	$652,629	$2,625,710	$14,567,100
Tyler	$21,223	$85,386	$473,712
Doddridge	$567,169	$2,281,881	$12,659,578
Harrison	$15,515	$62,420	$346,296
Marshall	$12,578	$50,607	$280,759
TOTAL	**$1,269,114**	**$5,106,004**	**$28,327,446**

[a] The property taxes identified in this table are estimates based on the currently proposed route. These estimates could change based on the final approved route.

[b] Because DETI is a public utility, property tax is assessed by the Commonwealth of Pennsylvania through the Public Utility Realty Act (PURTA). DETI would be subject to PURTA taxes which would then be distributed to local tax jurisdictions in the Commonwealth based on various parameters.

We received comments that the two economic impact studies commissioned by Atlantic and DETI were inadequate and did not accurately capture the positive and negative economic impacts of the construction and operation of ACP. One of these comments included a study conducted by Key-Log Economics on behalf of Friends of Nelson County, titled *Economic Costs of the Atlantic Coast Pipeline: Effects on Property Values, Ecosystem Services, and Economic Development in Western and Central Virginia* (Phillips et al., 2016). The study, focused on Nelson County, Virginia and identified economic impacts on land value, natural benefits, and economic sectors. As discussed in section 4.9.7, we find no conclusive evidence indicating that natural gas pipeline easements would have a negative impact on property values. Additionally, Nelson County would receive positive economic impacts in the form of direct, indirect, and induced spending during construction of ACP. Finally, Atlantic would pay approximately $7.7 million in property taxes to Nelson County from the years 2019 to 2025.

We received comments on the draft EIS from several local business owners concerned that construction of ACP and SHP would negatively impact their businesses and may, in some instances force them to close. We acknowledge that businesses may be directly and indirectly impacted by the projects; however, overall, the economic effects resulting from construction of ACP and SHP would be beneficial at the state, local, and county levels in the form of increased sales and payroll taxes. In the short-term, the projects would create economic stimulus to the affected areas via payroll and materials expenditures and sales taxes. Atlantic and DETI would purchase goods, materials, and services locally when possible. Workers on both projects would also most likely spend a portion of their pay in local communities on items such as housing, food, automobile expenses, entertainment, and miscellaneous other items.

Additionally, we received comments that the project would cause a delay or potentially prevent two large projects from being developed in the Rockfish Valley area. The first is the development of a self-described luxury hotel at Wintergreen Resort. The proposed hotel would consist of 150 rooms and is estimated to produce $8.5 million to $12 million in annual revenues and contribute 150 permanent, full-time jobs, plus seasonal jobs to the local economy (Friends of Wintergreen, 2016). Based on information provided from the developers, Wintergreen Pacific LLC and Pacific Group Resorts, developers "would be forced to discontinue development of [the] hotel, or substantially delay its development" if ACP is constructed (Friends of Wintergreen, 2016). Based on information provided by Wintergreen Property Owners Association Inc. and Wintergreen Resort Inc., the hotel would be located over 1 mile east of the project near AP-1 MPs 159.0 to 160.0. Concerns include blocking access along Beech Grove Road leading to the resort area and hindering future development and sale of lots. Commenters speculated that if the hotel at Wintergreen Resort was not developed the value of the existing resort would diminish, impacting the future viability of the resort. Wintergreen Resort is cited as the largest employer in Nelson County, and commenters speculated that any diminishing value or opportunities for the resort could cause negative economic impacts for the entire Rockfish Valley area and the county, including the loss of property values if Wintergreen Resort folded (Friends of Wintergreen, 2016).

The second development is the Spruce Creek Resort and Market, a proposed five-star destination resort, hotel, restaurant, and public market on 100 acres of mature woodland along Virginia State Route 151 and bisected by Spruce Creek. According to developers, the development has the potential to create 100 permanent, full-time jobs, plus seasonal jobs and is estimated to produce $15 million to $20 million in annual revenue (Friends of Wintergreen, 2016). Specifically, the developer is concerned that ACP would cross the middle of the property, eliminating the attractiveness of the resort area and, thus, development of the resort would be stopped. Based on information provided by the developer, the AP-1 mainline would cross the resort between approximate MPs 162.4 and 162.7 in Nelson County, Virginia.

We believe that construction of ACP and development of the hotel at Wintergreen Resort and the development of Spruce Creek Resort and Market could be accomplished such that impacts associated with

ACP are reduced or mitigated for, while maintaining the appeal of the area, as demonstrated by other residential and commercial developments in the area and similar projects throughout the country.

4.9.9 Environmental Justice

EO 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to consider if impacts on human health or the environment (including social and economic aspects) would be disproportionately high and adverse for minority and low-income populations and appreciably exceed impacts on the general population or other comparison group. We received comments expressing concern that ACP and SHP pipeline and aboveground facilities were sited through areas with disproportionately high concentrations of low-income and minority populations, thus unduly impacting these environmental justice communities.

Consistent with EO 12898, the CEQ called on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997a):

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the process.

The EPA's Environmental Justice Policies focus on enhancing opportunities for residents to participate in decision making. The EPA (2011) states that Environmental Justice involves meaningful involvement so that: "(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected."

In accordance with EO 12898, all public documents, notices, and meetings for ACP and SHP were made readily available to the public during our review of the project. Atlantic and DETI met with many different stakeholders during the initial development of the route, including local residents and affected landowners. These efforts involved several open houses with the affected communities and local authorities. Atlantic and DETI also established, and are maintaining, a project website to share project information with the public.

Atlantic and DETI also used the FERC's Pre-filing Process (see section 1.3). One of the major goals of this process is to increase public awareness and encourage public input regarding every aspect of the project (e.g., design, routing, environmental concerns and impacts) before an application is filed. As part of this process, FERC staff participated in several of Atlantic's and DETI's open houses and hosted several FERC scoping meetings to receive input from the public about ACP and SHP. Interested parties have had, and will continue to be given, opportunities to participate in the NEPA review process. To date, this included the opportunity to participate in the public scoping meetings within the project area to identify concerns and issues that should be covered in the EIS, and the opportunity to submit written comments about the projects to the FERC. Stakeholders will also have the opportunity to review this draft EIS and provide comments directly to the FERC staff in person (during scheduled comment sessions) or in writing.

4.9.9.1 Demographic and Economic Data

Based on published EPA guidance concerning environmental justice reviews (EPA, 1998), we used a three-step approach to conduct our review. These steps are:

1. Determine the existence of minority and low-income populations.
2. Determine if resource impacts are high and adverse.
3. Determine if the impacts fall disproportionately on environmental justice populations.

For the purposes of this review, a low-income population exists when the percentage of all persons living below the poverty level is more than the percentage for the state where the census tract is located. Also, for the purpose of this review, minority population exists when:

1. the total racial minorities in a U.S. Census Bureau-defined census tract (U.S. Census Bureau, 2013) are more than 50 percent of the tract's population;

2. the percentage of a racial minority in a census tract is "meaningfully greater"[30] than in the comparison group;

3. the total ethnic minorities in a census tract are more than 50 percent of the tract's population; or

4. the percentage of ethnic minorities in a census tract is meaningfully greater than in the comparison group.

Racial and ethnic minorities include: African American/Black, Native American or Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, two or more races, and other races; and the Hispanic or Latino ethnicity.

Appendix U provides an overview of the racial and economic characteristics of the population within the 136 unique census tracts within a 1-mile radius of all ACP and SHP facilities (this includes the pipeline, compressor stations, all aboveground facilities, and contractor yards). In West Virginia, minorities comprise 6.4 percent of the total population. The percentage of minorities in the West Virginia census tracts within 1 mile of ACP or SHP ranges from 0.1 to 6.9 percent. No census tracts within 1 mile of ACP or SHP have a minority population greater than 50 percent or meaningfully greater than that of the county in which it is located. In Virginia, minorities comprise 30.8 percent of the total population. The percentage of minorities in the Virginia census tracts within 1 mile of ACP ranges from 0.2 to 100 percent. In 15 of the 63 census tracts, the minority population is greater than 50 percent or meaningfully greater than that of the county in which it is located. In North Carolina, minorities comprise 30.5 percent of the total population. The percentage of minorities in the North Carolina census tracts within 1 mile of ACP ranges from 12.5 to 95.5 percent. In 20 of the 42 census tracts, the minority population is greater than 50 percent or is meaningfully greater than that of the county in which it is located. In Pennsylvania, minorities comprise 18.1 percent of the total population. The percentage of minorities in the Pennsylvania census tracts within 1 mile of SHP ranges from 0.1 to 42.8 percent. In one of the nine census tracts, the minority population is meaningfully greater than that of the county in which it is located.

To restate, for this analysis, a low-income population exists when the percentage of all persons living below the poverty level is greater than the percentage of persons below poverty level for the state

[30] "Meaningfully greater" is defined in this analysis when minority or ethnic populations are at least 10 percentage points more than in the comparison group, which was the county in which the census tract was located.

where the census tract is located. In West Virginia, 18.1 percent of all persons live below the poverty level. Nine of the 22 census tracts in West Virginia within a 1-mile radius of ACP and SHP project facilities have a higher percentage of persons living below the poverty level when compared to the state. In Virginia, 11.5 percent of all persons live below the poverty level. Thirty-four of the 63 census tracts in Virginia within a 1-mile radius of ACP facilities have a higher percentage of persons living below poverty-level when compared to the state. In North Carolina, 17.6 percent of all persons live below the poverty level. Twenty-seven of the 42 census tracts in North Carolina within a 1-mile radius of ACP facilities have a higher percentage of persons living below poverty-level when compared to the state. In Pennsylvania, 13.5 percent of all persons live below the poverty level. No census tracts within 1 mile of SHP project facilities have a low-income population meaningfully greater than that of the state.

We received numerous comments on the draft EIS expressing concern about minority and low-income communities near the proposed Compressor Station 2 in Buckingham County, Virginia. Using the methodology described above, we determined that the proposed Compressor Station 2 would be within a census tract that is designated a low-income environmental justice population. The two other census tracts within 1 mile of the proposed Compressor Station 2 are also designated low-income environmental justice populations. None of the three census tracts within 1 mile of the proposed Compressor Station 2 are designated minority environmental justice populations based on the methodology described above. The nearest residence to the proposed Compressor Station 2 is approximately 1,450 feet from the site.

The construction and operation of the proposed facilities would affect a mix of racial/ethnic and socioeconomic areas in the ACP and SHP project area. Not all impacts identified in this EIS are considered to affect minority or low-income populations. The primary adverse impacts on the environmental justice communities associated with the construction of ACP and SHP would be the temporary increases in dust, noise, and traffic from project construction. These impacts would occur along the entire pipeline route and in areas with a variety of socioeconomic backgrounds.

Due to the number of comments we received regarding environmental justice and specifically impacts resulting from increased air and noise emissions at the proposed Compressor Station 2, we have expanded our discussion of the potential for the risk of impacts to fall disproportionately on environmental justice communities. Risk is defined as the likelihood and probability for experiencing an impact, in this case negative health outcomes from adverse project impacts. The approach to determining disproportionality in this impact assessment was done by considering the risk for environmental justice populations to experience negative health outcomes that could result from increased air emissions and noise.

As discussed in section 4.11.1, air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO_2), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$). These air pollutants are known to increase the effects of asthma[31] and may increase the risk of lung cancer (Nafstad et al., 2003).

Due to high rates of asthma within the overall African American community, we consider this community especially sensitive. Based on American Lung Association statistics, "African Americans have one of the highest rates of current asthma compared to other racial/ethnic groups" (American Lung

[31] Asthma is a chronic disorder impacting the lung airways where periods of reversible airflow obstruction is experienced. Individuals experience asthma "episodes" or "attacks" from a variety of events including exercise, airway infections, airborne allergens, occupational exposures, and air pollutions such as particulate matter and VOCs. Asthma is incurable but controllable though appropriate medical care with medication and avoiding exposures to triggers for attacks (Center for Disease Control and Prevention, 2013).

Association, 2010). Prevalence rates are consistently high between African Americans and Caucasians in all age groups (American Lung Association, 2010). African American, multi-race, and adult females aged 18-24 have the highest adult prevalence of asthma. Prevalence in children is highest in African Americans when compared to other racial/ethnic groups (Centers for Disease Control and Prevention [CDC], 2013).

When considering the health impacts associated with compressor station emissions, increased rates of lung cancer were identified associated with the compounds emitted by compressor station operations (Nafstad et al., 2003). Studies have shown that several different cancer-related compounds and chemicals are present in the air in proximity to construction and operation of compressor stations, and that some of these have documented health effects on the general and vulnerable populations (Southwest Pennsylvania Environmental Health Project, 2015).

As noted previously, African American populations have a greater prevalence of asthma. Thus, it is reasonable to assume that, where African American populations exceed the thresholds for environmental justice populations identified in this analysis, those populations have an increased risk over Caucasian populations (and therefore disproportionate) of experiencing adverse effects from decreased air quality. Further, it is recognized that low income populations have greater risks associated with negative health outcomes (CDC, 2017).

The proposed new and modified compressor stations would be gas-driven; air quality impacts and mitigation measures associated with compressor station operation are discussed in section 4.11.1. Health risks related to ACP and SHP would be associated with an unanticipated pipeline or compressor station failure, gas leaks, and blowdowns at compressor stations. Section 4.12 describes the risks to public safety that could result from a pipeline failure and describes how applicable safety regulations and standards would minimize the potential for these risks. Because the projects would generally traverse rural areas, the number of persons who would be at risk of injury due to a pipeline failure would be low, and there is no evidence that such risks would be disproportionately borne by any racial, ethnic, or socioeconomic group.

Atlantic and DETI would implement a series of measures that would minimize potential impacts on the nearby communities, including environmental justice communities near project facilities. For instance, Atlantic and DETI propose to employ proven construction-related practices to control fugitive dust, such as application of water or other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic. Some individuals with extreme sensitivity to changes in air quality could be impacted by temporary fugitive dust during construction or air emissions from the compressor stations. However, not all individuals within the identified and surrounding environmental justice populations would be impacted.

Similarly, noise control measures would be implemented by Atlantic and DETI during construction and operation of the projects. Additionally, Atlantic and DETI (per their proposed mitigation measures and our additional recommendations) would ensure that the operational noise attributable to the new compressor stations and compressor station modifications would be less than 55 L_{dn} at nearby NSAs, and the increase in the overall noise due to the new stations would be below the threshold considered perceptible to the human ear at most NSAs.

Due to construction dust and compressor station emissions, African American populations near ACP and SHP could experience disproportionate health impacts due to their susceptibility to asthma. Health impacts from construction dust would be temporary, localized, and minor. Health impacts from compressor station emissions would be moderate because, while they would be permanent facilities, air emissions would not exceed regulatory permittable levels. As a result, no disproportionately high and adverse impacts on environmental justice populations as a result of air quality impacts, including impacts associated with the proposed Compressor Station 2, would be expected as a result of ACP and SHP. Also, no disproportionately high and adverse impacts on environmental justice populations as a result of other resources impacts would be expected.

4.9.10 Socioeconomics on Federal Lands

ACP's AP-1 mainline would cross approximately 21.2 miles of NFS lands and 0.1 mile of NPS-owned land (associated with the BRP). Table 4.8.9-1 identifies the location and distance of crossings of ACP over federal lands.

The socioeconomic data for the counties crossed by ACP where federal lands are located (Pocahontas, West Virginia for the MNF; Highland, Bath, and Augusta Counties, Virginia for the GWNF; and Augusta and Nelson Counties, Virginia for the BRP) are presented in the tables throughout section 4.9. Information regarding specific recreational and special interest areas on federal lands are discussed in detail in section 4.8.9.

4.9.10.1 Recreation and Tourism

Potential visual impacts of ACP on federal lands as it relates to recreation are discussed in detail in section 4.8.9. There are a wide variety of recreational activities that take place on federal lands that would be crossed by ACP. As further described in section 4.8.9, we do not believe construction and operation of ACP would have a significant adverse effect on recreation on federal lands. There is a possibility of conflict between pipeline construction traffic and visitors using roads on federal lands, particularly during peak tourism season (see section 4.9.10.2). Additionally, due to the influx of non-local construction workers to the project area, there may be increased competition (and cost) for short-term housing, which may decrease housing availability for tourists and recreationalists near federal lands. However, given the sufficient amount of short-term housing available in the entire ACP and SHP project area and surrounding metropolitan statistical areas, we do not believe the construction of ACP would create a significant adverse impact on visitors looking for accommodations during trips to federal lands.

4.9.10.2 Transportation and Traffic

Pipeline construction would require the use of several existing roads and the construction of new access roads on FS land to access the pipeline right-of-way during construction and operation (see table 4.8.9-3). Access road construction activities would affect public access. To minimize and mitigate potential impacts, Atlantic would prepare spread-specific traffic and transportation management plans for managing vehicle traffic during construction of ACP, considering peak travel times, emergency services, and visitor traffic. The FS has stated traffic and transportation impacts on NFS lands cannot be fully assessed until spread-specific plans are provided.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC, as lead federal agency, and the cooperating agencies to consider the effect of their undertakings on properties listed in or eligible for listing in the NRHP and to afford the ACHP an opportunity to comment. Atlantic and DETI, as non-federal parties, provided us with information, analyses, and recommendations, in accordance with the ACHP's regulations for implementing section 106 at 36 CFR 800.2(a)(3), and the FERC's regulations at 18 CFR 380(f). The federal land managing agencies have obligations regarding cultural resources under other federal laws and regulations, including the Federal Land Policy and Management Act, the Antiquities Act of 1906, section 110 of the NHPA, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act (ARPA) of 1979, and the Native American Graves Protection and Repatriation Act.

Construction and operation of ACP and SHP could adversely affect historic properties (i.e., cultural resources listed or eligible for listing in the NRHP). These historic properties could include prehistoric or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Such historic properties generally must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet one or more of the criteria specified in 36 CFR 60.4. Direct effects could include destruction or damage to all, or a portion, of an historic property. Indirect effects could include the introduction of visual, atmospheric, or audible elements that affect the setting or character of a historic property. Atlantic's and DETI's inventory of cultural resources sites within the projects' area of potential effects (APE), and recommendations of their eligibility for listing in the NRHP, is presented below.

If a historic property would be adversely affected by the projects, avoidance or other mitigation would be proposed. Avoidance might include, but would not be limited to, realignment of the pipeline route, relocation of temporary workspace, use of boring, or changes in the construction and/or operational design. Mitigation might include the systematic professional excavation of an archaeological site, the preparation of photographs and/or measured drawings documenting standing structures or other historic features, or the use of landscaping or other techniques that would minimize or eliminate effects on the historic setting or ambience of standing structures or other resources.

4.10.1 Cultural Resources Investigations

In the NOI, the FERC stated that the APE for natural gas facility projects encompasses at a minimum all areas subject to ground disturbance (examples include construction right-of-way, contractor/pipe storage yards, compressor stations, and access roads). Project-specific APEs were developed for archaeological and historic architecture surveys according to the guidelines and requirements for each state.

4.10.1.1 Atlantic Coast Pipeline

ACP is in West Virginia, Virginia, and North Carolina. The ACP route crosses the MNF in West Virginia and the GWNF in Virginia. Atlantic consulted with the FS and prepared separate survey reports for each of the national forests. The cultural resources studies for federal lands, which include the MNF, GWNF, and the BRP, are discussed in section 4.10.6.

Atlantic contracted with ERM (formerly Natural Resource Group, LLC) to assist with the cultural resources investigations for ACP. Atlantic described the APE for direct project effects as the construction footprint where ground-disturbing activities are possible. Atlantic surveyed a 300-foot-wide linear corridor for the pipeline, a 50-foot-wide corridor for access roads, and the footprint for off-corridor facilities and extra workspaces. Atlantic described the APE for historic architecture (above ground) resources as the area for direct effects plus the surrounding areas within view of new construction, or changes to the landscape. The size of this APE varied according to the topography and surroundings, and was expanded in some locations during the project to address agency requirements.

Atlantic conducted surveys for the original route, reroutes, and smaller route adjustments. This discussion addresses only the cultural resources within the current APE. Atlantic has completed cultural resources surveys of approximately 98 percent of the proposed project facilities, leaving 2 percent of the project workspace remaining to be surveyed.

Surveys, reporting, and NRHP determinations are not complete for cultural resources along ACP. Atlantic continues to conduct reconnaissance surveys for those areas not yet surveyed, and has begun evaluative testing for sites in the APE that cannot be avoided. Atlantic would file with us reports on surveys and evaluative testing as they are prepared, and will continue to consult with the relevant SHPOs and other stakeholders regarding site significance, as well as evaluative testing plans, treatment plans, and mitigation of adverse effects on historic properties.

West Virginia

In West Virginia, Atlantic submitted separate reports for archaeology and historic architecture surveys. As described in section 2.1, the portion of ACP in West Virginia includes a portion of the AP-1 mainline, two new M&R stations, one pig launcher, and a newly proposed Compressor Station 1 (in Lewis County), as well as various valves that would be installed within the pipeline right-of-way. The project in West Virginia as currently designed would also include three new communication towers, two cathodic protection groundbeds, and off-corridor yards and access roads.

Atlantic conducted surveys of 98.7 percent of all pipeline facilities and 75 percent of the locations of microwave towers for direct impacts (archaeological resources), and 100 percent of all project locations for historic architectural resources (above ground resources). To date, landowners have not granted access to a small number of unsurveyed parcels. In addition to surveying the majority of the AP-1 mainline, Atlantic surveyed Compressor Station 1 and all aboveground facility locations, as well as five contractor yards, three pipe yards, three water impoundment areas, and multiple access roads. Surveys have not yet been completed along a portion of the AP-1 mainline and access roads, and the locations of microwave towers. In addition, Atlantic has not reported on the complete surveys of cathodic protection groundbeds.

Atlantic reports that 20 cultural sites that are recommended eligible for listing on the NRHP are unevaluated for eligibility and treated as eligible, or are cemeteries in the APE in West Virginia; 14 are historic standing structures or linear resources, and 1 is an archaeological site. There are also five stand-alone cemeteries (three additional cemeteries are associated with standing structures). Atlantic archaeologists did not identify any locations in West Virginia that required deep testing for possible deeply buried archaeological sites.

Atlantic's contractor ERM submitted one report and four addenda for archaeological resources to the West Virginia Division of Culture and History (WVDCH).[32] Atlantic's contractor Dovetail Cultural Resources Group submitted an initial historic architecture survey report and two addenda. ERM produced a third, fourth, and fifth historic architecture survey report addenda that documented the re-survey of portions of the APE, along with survey of new locations of the APE. In these reports, ERM made recommendations for eligibility, and committed to preparing a supplemental report that will summarize the work completed to date and identify the potential historic properties that remain in the West Virginia APE.

ERM conducted Phase II testing at one additional site (46PH775) and recommended that the site is not eligible for listing on the NRHP. This was the only archaeological site recommended for evaluative testing in West Virginia. The WVDCH commented that because only the portion of the site in the APE was evaluated, the NRHP status of the site should remain unevaluated. The agency agreed that the portion within the APE lacks research potential and construction here will not have adverse effect on 46PH775.

[32] The West Virginia Division of Culture and History serves as the West Virginia SHPO.

The WVDCH reviewed and provided comments on archaeology and historic architecture reports. The agency has reviewed four archaeological reports and concurred with Atlantic's findings. The agency provided comments on six historic architecture reports, and noted that it is waiting for the ERM comprehensive report on all historic architecture properties in the APE. Atlantic also submitted a report of the additional survey and delineation of the five standalone cemeteries in West Virginia. Table 4.10.1-1 summarizes the cultural sites identified to date in the APE in West Virginia that are recommended eligible or potentially eligible for listing in the NRHP, are unevaluated for eligibility, or are cemeteries that would be avoided during construction. The table is based on numerous reports and other filings, and is the best data currently available. It is subject to changes while adjusting the project route and workspace and additional cultural resources investigations.

In a February 2016 letter to the WVDCH, Ms. April Keating asked about seven properties near the project in Upshur County. Ms. Keating asked why the sites were not included in Atlantic's historic architecture survey report. In follow-up correspondence, Atlantic explained that four of the sites were not in the project APE; one site was previously recorded and determined not eligible; one site was built after 1967 and was less than 50 years old; and the final site, the Simmons Cemetery (46UP331), was recorded for this project.

Several landowners commented that cultural resources sites, including historic cemeteries, may be affected by ACP in West Virginia. Atlantic would be required to complete surveys and evaluate the significance of cultural sites within the APE prior to construction (see section 4.10.7). State and local laws protect cemeteries and burials from disturbance. Atlantic conducted additional survey at five cemeteries and submitted a cemetery delineation report. Atlantic would file treatment plans identifying methods (e.g., fencing, vegetation buffers) to avoid impacts on cemeteries during construction. In addition, avoidance measures would be depicted on construction alignment sheets.

Civil War Battlefields

We received several comments regarding possible impacts on Civil War sites and other potential historic properties near Valley Mountain and Mingo Flats in West Virginia. We also received comments about project effects on historic sites associated with Cheat Mountain. Subsequent to these comment submissions, Atlantic incorporated route alternatives to avoid historic sites near these locations in West Virginia, including the Cheat Mountain Battlefield.

Virginia

In Virginia, Atlantic submitted survey reports for archaeology and separate reports for historic architecture. As described in section 2.1, the portion of ACP in Virginia includes part of the AP-1 mainline and AP-3 lateral, all the AP-4 and AP-5 laterals, Compressor Station 2 (in Buckingham County), 4 M&R stations, 7 pig launcher/receiver facilities, 10 cathodic protection groundbeds, 16 communication towers, and numerous off-corridor contractor yards and access roads. Atlantic reported that they have completed the survey of 98.4 percent of the direct impact APE for all project facilities, and 100 percent of the APE for historic architecture resources in Virginia. Atlantic would survey and report on the remaining 1.6 percent of the APE for direct effects that has not been surveyed.

TABLE 4.10.1-1

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in West Virginia

Site Name and Number	County	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Response
LE-0004/ 46LE61 Broad Run Baptist Church and Cemetery	Lewis	Historic Church and Cemetery	Avoid	Eligible	Concur; cemetery treatment plan pending
HS-0884/ 46HS121 Mount Lebanon Cemetery	Harrison	Historic Church and Cemetery	Avoid cemetery	Not Eligible	Pending; Requested more information; cemetery treatment plan pending
PH-0037-0058	Pocahontas	Historic Railroad	Avoid by drilling	Eligible	Concur
PH-0037-64	Pocahontas	House	Avoid or mitigate	Eligible	Pending additional information
PH-0037-65	Pocahontas	Historic Commercial	Avoid or mitigate	Eligible	Pending additional information
PH-0095	Pocahontas	Historic Structure	Avoid or mitigate	Eligible	Concur
PH-0092	Pocahontas	Historic CCC Trail	Avoid or mitigate	Eligible	Concur
PH-0461	Pocahontas	House	Avoid or mitigate	Eligible	Pending additional information
PH-0471	Pocahontas	House	Avoid or mitigate	Eligible	Concur
PH-0902	Pocahontas	Historic Railroad	Avoid or mitigate	Eligible	Concur
PH-0903	Pocahontas	House	Avoid or mitigate	Eligible	Concur
PH-0954	Pocahontas	Barn	Avoid or evaluate	Not Eligible	Pending additional information
UP-0113/ 46UP348	Upshur	Historic Church and Cemetery	Avoid or Mitigate	Eligible	Pending additional information; cemetery treatment plan pending
46PH775	Pocahontas	Prehistoric and Historic	None	Not Eligible in APE	Revised to Unevaluated; No Adverse Effect in APE
46PH779	Pocahontas	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
46PH790	Pocahontas	Historic Cemetery	Avoid	Not Eligible	Pending; cemetery treatment plan pending
46UP319	Upshur	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
46RD722	Upshur	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
46UP331 / Simmons Cemetery	Upshur	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
UP-0825	Upshur	House	Avoid or Evaluate	Unevaluated	Pending
UP-0830 WWII Training Airfield	Upshur	Structures	None; no adverse effect	Eligible	Concur

In Virginia, Atlantic surveyed its originally proposed route, as well as subsequent reroutes, and route variations. The few parcels that have not been surveyed are waiting for landowner permission to enter. Atlantic completed the historic architecture surveys for all facilities in Virginia, and completed archaeological survey of 98.9 percent of the pipeline corridor, 94 percent of access routes, Compressor Station 2, M&R stations, pig launcher/receiver facilities, cathodic groundbeds, contractor yards and microwave tower locations. The remaining parcels will be surveyed when access to enter has been granted.

Atlantic recorded 110 cultural resources sites in the current APE that are potentially eligible for listing in the NRHP or have not been evaluated for listing, or are cemeteries that are protected by state laws. Of the 110 sites, 22 are archaeological sites, 71 are historic architecture sites (8 including cemeteries), and 17 are cemeteries. Of the 22 archaeological sites, 21 date to the prehistoric period (4 also have historic components), and 1 site has an unknown temporal or cultural component. Of the 71 historic architecture sites, 6 are Civil War battlefields, 46 are standing structures (domestic or commercial), 5 are historic districts or landscapes (including the BRP, which is also a linear resource), and 5 are linear resources (including railroads, the ANST, and the Dismal Swamp Canal), and 8 are structures that include cemeteries (7 associated with churches and 1 with a house). One historic architecture site has an unknown temporal or cultural component. Atlantic conducted systematic metal detecting over the battlefields in the APE in Virginia; these surveys did not identify archaeological evidence of Civil War activity.

Geomorphological investigations identified five locations in Virginia that may contain deeply buried living surfaces. Atlantic conducted deep testing using deep auger probes and mechanical excavation at the five locations and identified one archaeological site (44GV0402), which Atlantic recommends as not eligible for NRHP listing. We have not received SHPO comments on these findings and eligibility recommendations.

Atlantic's contractor ERM submitted an initial archaeology report and four addenda for the APE in Virginia to the VDHR[33] for its review. The agency concurred with most of Atlantic's findings and recommendations, except for three sites that required further evaluation. In addition, Atlantic's contractor Dovetail Cultural Resources Group prepared an initial historic architecture survey report and two addenda. ERM produced a third addendum that documented the re-survey of portions of the APE, along with survey of new locations of the APE. In this third addendum, ERM made recommendations for eligibility and additional work, and committed to preparing a supplemental report that will summarize the work completed to date, and identify those historic architecture resources that remain in the APE. ERM submitted a fourth, fifth, and sixth addendum historic architecture survey report. The VDHR reviewed six historic architecture reports and concurred with most of the reports' findings. The agency did not concur with eligibility recommendations for four properties, and asked for additional information before commenting on several other properties. The VDHR comments on historic architecture report addenda 5 and 6 are pending.

ERM conducted Phase II testing at 19 archaeology sites, and recommended that 13 sites are not eligible, or the portion of the site in the APE is recommended not eligible for the NRHP. ERM recommended that 6 sites are eligible for listing. VDHR comments regarding Atlantic's recommendations after Phase II testing are pending.

Table 4.10.1-2 summarizes the cultural resources identified to date in Virginia that are listed or recommended eligible for listing, are not evaluated for eligibility, or are cemeteries that would be avoided during construction. The table is based on numerous reports and other filings, and is the best data currently available. It is subject to changes while adjusting the project route and workspace, and completion of additional cultural resources investigations.

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[33] The VDHR serves as the Virginia SHPO.

TABLE 4.10.1-2

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
44AU0024	Augusta	Prehistoric and Historic	Avoid or Mitigate	Eligible after testing	Pending after testing
44AU0870	Augusta	Prehistoric	Avoid or Evaluate	Unevaluated	Potentially Eligible
44AU0907	Augusta	Prehistoric	Avoid or Mitigate	Eligible after testing	Pending after testing
44AU0918	Augusta	Prehistoric	Avoid or Evaluate	Unevaluated	Pending
44AU0781	Augusta	Prehistoric	Avoid or Evaluate	Unevaluated	Pending
44AU0917	Augusta	Prehistoric	Avoid or Evaluate	Unevaluated	Pending
44AU0924	Augusta	Prehistoric	Avoid or Evaluate	Not Eligible after testing	Pending
44BK0366	Buckingham	Historic Cemetery	Avoid	Not Eligible	Potentially Eligible
44BK0386	Buckingham	Historic Cemetery	Avoid	Not Eligible	Pending
44BR0340	Brunswick	Historic Cemetery	Avoid	Unknown	Pending
44BR0349	Brunswick	Prehistoric and Historic	Avoid or Evaluate	Not Eligible after testing	Pending
44DW0451	Dinwiddie	Prehistoric	Avoid or Evaluate	Unevaluated	Potentially Eligible
44NE0197	Nelson	Historic Cemetery	Avoid	Unknown	Pending
44GV0373	Greensville	Prehistoric	Avoid Impacts by Using Mats	Unevaluated	Potentially Eligible
44GV0388	Greensville	Prehistoric	Avoid outside of APE	Unevaluated; Not Eligible in APE	Pending after testing
44GV0394	Greensville	Historic Cemetery	Avoid	Not Eligible	Pending; cemetery treatment plan pending
44GV0400	Greensville	Historic Cemetery	Avoid	Not Eligible	Pending; cemetery treatment plan Pending
44NT0312	Nottoway	Historic Cemetery	Avoid	Unknown	Pending; cemetery treatment plan Pending
44NT0313	Nottoway	Historic Cemetery	Avoid	Not Eligible	Concur; treatment plan pending
44SN0308	Southampton	Prehistoric	Avoid or Mitigate	Eligible after testing	Pending after testing
44SN0311	Southampton	Prehistoric	Avoid Impacts by using mats	Unevaluated	Potentially Eligible
44SN0335	Southampton	Unknown	Avoid or Evaluate	Unevaluated	Potentially Eligible

TABLE 4.10.1-2 (cont'd)

National Register or Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
44SN0336	Southampton	Historic Cemetery	Avoid	Unknown	Not Eligible; cemetery treatment plan pending
44SN0342	Southampton	Prehistoric	Avoid	Unevaluated; Not Eligible in APE	Pending after testing
44SN0384	Southampton	Prehistoric	Avoid	Unevaluated; Not Eligible in APE	Pending after testing
44SK0013	Suffolk	Prehistoric	Avoided by HDD	Unevaluated	Potentially Eligible
44SK0585	Suffolk	Prehistoric	Phase II ongoing	Unevaluated	Potentially Eligible
44SK0080/ 44SK0608 (sites combined after testing)	Suffolk	Prehistoric and Historic	Avoid or Mitigate	Eligible	Pending after testing
44SK0340	Suffolk	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
44SK0586	Suffolk	Historic Cemetery	Avoid	Not Eligible	Concur; cemetery treatment plan pending
44SK0591	Suffolk	Prehistoric	Avoid or Evaluate	Unevaluated	Potentially Eligible
44SK0612	Suffolk	Historic and Prehistoric	Avoid or Mitigate	Eligible	Pending
44CS0346	Chesapeake	Prehistoric	Avoid or Mitigate	Eligible	Pending
045-0007	Highland	House	Avoid or Mitigate	Eligible	Pending, requested Phase II survey
007-0015/ Folly Farm	Augusta	Historic Farmstead	Avoid or Mitigate	Listed	NA
007-0103	Augusta	House	Avoid or Mitigate	Eligible	Concur
007-0442	Augusta	Historic Farmstead	Avoid or Mitigate	Eligible	Pending
007-0445	Augusta	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
007-0447	Augusta	Historic Hall-Parlor	Avoid or Mitigate	Eligible	Concur
007-0463	Augusta	House	Avoid or Mitigate	Eligible	Concur
007-0272	Augusta	Unknown	Avoid or Mitigate	Eligible	Pending
007-0476	Augusta	Hoy's Store and P.O.	Avoid or Mitigate	Eligible	Concur
007-0487	Augusta	House	Avoid or Mitigate	Eligible	Concur
007-0480	Augusta	House	Avoid or Evaluate	Unevaluated	Concur, but requested more information
007-0490	Augusta	House	Avoid or Mitigate	Eligible	Does not Concur
007-5728	Augusta	House	Avoid or Mitigate	Eligible	Does not Concur

TABLE 4.10.1-2 (cont'd)

National Register or Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
007-0863	Augusta	Historic Church and Cemetery	Avoid or Mitigate	Eligible	Concur; cemetery treatment plan pending
007-5513/ VA Central Railroad	Augusta	Historic Linear Resource	Avoid or Evaluate	Unevaluated	Determined Eligible
007-5527	Augusta	House	Avoid or Mitigate	Eligible	Pending
007-5528	Augusta	House	Avoid or Mitigate	Unevaluated	Pending
007-5530	Augusta	Historic Farmstead	Avoid or Mitigate	Unevaluated	Determined Eligible
007-5542	Augusta	House	Avoid or Mitigate	Eligible	Pending
007-5554	Augusta	House	Avoid or Evaluate	Unevaluated; inaccessible	Pending
007-5583	Augusta	House	Avoid or Evaluate	Unevaluated, inaccessible	Concur
007-5587	Augusta	House	Avoid or Evaluate	Unevaluated; inaccessible	Pending
007-5689	Augusta	House	Avoid or Mitigate	Eligible	Concur
007-5729	Augusta	Historic Church and Cemetery	Avoid Cemetery	Not Eligible	Cemetery treatment plan pending
007-5730	Augusta	Historic Church and Cemetery	Avoid Cemetery	Not Eligible	Cemetery treatment plan pending
021-5012/ ANST	Augusta and Nelson	Historic Linear Resource	Avoid by HDD	Eligible	Concur
080-5161/ BRP Hist. District	Augusta and Nelson	Historic District	Avoid	Unevaluated	Determined Eligible
008-0011	Bath	Historic Farmstead	Avoid or Mitigate	Eligible	Concur
008-0126	Bath	House	Avoid or Mitigate	Eligible	Concur
008-5053	Bath	House	Avoid or Mitigate	Eligible	Concur
008-5066	Bath	House	Avoid or Mitigate	Eligible	Pending
008-5067	Bath	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
012-5174	Brunswick	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
012-5190	Brunswick	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
014-5059/ Second Liberty Baptist Church and Cemetery	Buckingham	Historic Church and Cemetery	Avoid	Eligible	Determined Eligible; Cemetery treatment plan pending

TABLE 4.10.1-2 (cont'd)

National Register or Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
014-5060/ First Liberty Baptist Church and Cemetery	Buckingham	Historic Church and Cemetery	Avoid	Eligible	Determined Eligible; cemetery treatment plan pending
014-5062	Buckingham	Historic Farmstead	Avoid or Mitigate	Eligible	Determined Eligible
014-5066	Buckingham	House	Avoid or Evaluate	Unevaluated, inaccessible	Concur
024-0416/ High Bridge Battlefield	Cumberland and Prince Edward	Historic Battlefield	Avoid or Mitigate	Eligible	Determined Eligible
024-5006/ Cumberland Church Battlefield	Cumberland	Historic Battlefield	Avoid or Mitigate	Eligible	Determined Eligible
045-0120/ McDowell Battlefield	Highland and Augusta	Historic Battlefield	Avoid or Mitigate	Eligible	Concur
062-0092	Nelson	House	Avoid or Mitigate	Eligible	Concur
062-0117/ Wintergreen Country Store	Nelson	Historic Commercial Building	Avoid or Mitigate	Listed	Concur
062-5119/ South Rockfish Valley Rural Historic District	Nelson	Historic Rural Historic District	Avoid or Mitigate	Listed	Concur
062-5119-0113	Nelson	House	Avoid or Mitigate	Eligible	Pending after Evaluation
062-5121/ Red Apple Orchards	Nelson	Historic Landscape	Avoid or Evaluate	Potentially Eligible	Concur
062-5160/ Warminster Rural Historic District	Nelson	Historic District	Avoid or Mitigate	Eligible	Concur
062-5180	Nelson	Chesapeake and Ohio Railroad	Avoid Using HDD	Eligible	Concur
014-5091	Buckingham	House	Avoid or Evaluate	Unevaluated; inaccessible	Pending
014-5074	Cumberland	House	Avoid or Evaluate	Unevaluated, inaccessible	Pending
004-5013/ Sayler's Creek Battlefield	Prince Edward	Historic Battlefield	Avoid or Mitigate	Eligible	Determined Eligible

TABLE 4.10.1-2 (cont'd)

National Register or Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
073-5014/ Rice's Station Battlefield	Prince Edward	Historic Battlefield	Avoid or Mitigate	Eligible	Determined Eligible
026-0007 Harper House	Dinwiddie	House	Avoid or Mitigate	Eligible	Concur
026-5222	Dinwiddie	House	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
026-5257	Dinwiddie	Historic Church and Cemetery	Avoid Cemetery	Not Eligible	Cemetery treatment plan pending
012-5017	Brunswick	Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
012-5191	Brunswick	Historic House	Avoid or Evaluate	Unevaluated	Pending
087-5618	Southampton	House	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
087-5505/ Powel Dairy Farm	Southampton	Historic Farmstead	Avoid	Eligible	Determined Eligible
087-5609	Southampton	Church and Cemetery	Avoid Cemetery	Not Eligible	Pending; Cemetery treatment plan pending
087-5610	Southampton	House	Avoid or Evaluate	Unevaluated, inaccessible	Concur
131-5325/ Sunray Agricultural Historic District	Chesapeake	Historic District	Avoid or Mitigate	Eligible	Pending
133-0025	Suffolk	House	Avoid or Evaluate	Potentially Eligible	Concur
133-0101	Suffolk	Historic Farmstead	Avoid or Mitigate	Eligible	Concur
133-0105	Suffolk	Corn Crib	Avoid or Evaluate	Unevaluated	Pending
133-5039/ Suffolk II Battlefield	Suffolk	Historic Battlefield	Avoid or Mitigate	Eligible	Concur
133-5443	Suffolk	House	Avoid or Mitigate	Eligible	Pending
133-5474	Suffolk	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
133-5481	Suffolk	Historic House and Cemetery	Avoid Cemetery	Not Eligible	Cemetery treatment plan pending
133-5482	Suffolk	House	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
133-5492	Suffolk	House	Avoid or Mitigate	Eligible	Pending
133-5498	Suffolk	House	Avoid or Evaluate	Unevaluated, inaccessible	Pending survey

TABLE 4.10.1-2 (cont'd)

National Register or Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in Virginia

Site Name and Number	County/City	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
133-5499	Suffolk	House	Avoid or Evaluate	Unevaluated, inaccessible	Pending survey
133-5499	Suffolk	Historic Structure	Avoid or Evaluate	Unevaluated	Pending
133-5498	Suffolk	Historic Structure	Avoid or Evaluate	Unevaluated	Pending
131-0035	Suffolk	Dismal Swamp Canal	Avoid or Mitigate	Listed	NA
091-5098/ Norfolk Petersburg Railroad		Historic Railroad	Avoid Using HDD	Eligible	Concur

We received several comments regarding cultural sites such as prehistoric artifacts, historic structures, and burials on landowners' properties that may be affected by ACP in Virginia. In response, Atlantic identified landowner parcels that would no longer be affected by ACP, and identified parcels where surveys were completed, but no historic properties were identified within the APE on commenter's parcels. In addition, subsequent to certain comments, Atlantic adopted route modifications to avoid cultural sites in Virginia. Atlantic also reported that it has not been granted access to survey at certain parcels, and cannot complete those surveys and report on their findings. Atlantic would be required to complete surveys and evaluate the significance of cultural sites within the APE prior to construction (see section 4.10.7).

Yogaville

We received numerous comments regarding the Satchidananda Ashram-Yogaville community and Light of Truth Universal Shrine. Stakeholders expressed concerns that the peaceful setting of the culturally significant retreat would be impacted by the project. In its May 4, 2016 meeting of the review board, the VDHR granted Yogaville approval to proceed with a NRHP nomination as a historic district that represents the historic interfaith movement (VDHR, 2016).

We asked Atlantic to consider effects on the Yogaville cultural site, and the company responded that the pipeline route is located approximately 0.5 mile to the southwest of Yogaville and 1.0 mile from the shrine which is the focus of the property. An inventory of the historic district (DHR ID #014-5067) has not been finalized and the final boundaries have not been determined. The VDHR stated in a comment letter that the analysis of impacts on Yogaville has not been completed, and the VDHR has rendered no opinion on effects to this property.

Linear Resources

We received several comments regarding potential impacts on linear resources. The ACP route crosses four linear historic resources in Virginia, not including waterbodies. The ANST and the BRP are both federal properties that are eligible for listing in the NRHP. Atlantic proposes to avoid effects on these historic properties by using the HDD method for construction (see section 2.3.3.2; also see section 4.10.6 regarding temporary adverse effects to the ANST). Atlantic also proposes to use an HDD to install the pipeline under the NRHP-eligible Chesapeake and Ohio Railroad and the Norfolk Petersburg Railroad.

Civil War Battlefields

In Virginia, Atlantic identified six Civil War battlefields within the project APE. Some of these are in the Shenandoah Valley, and included in the Shenandoah Valley Battlefields National Historic District. The Shenandoah Valley Battlefields Foundation (SVBF) supports programs and promotes the protection and study of the Civil War battlefields within the historic district. Atlantic has consulted with the SVBF and met with them in April 2016. Atlantic provided updates about the project, route modifications, and field survey reports to the SVBF and would continue to consult with them as needed.

As required in the VDHR survey guidelines, Atlantic conducted systematic metal detecting over the battlefields in the APE in Virginia. These surveys did not detect any buried material such as metal objects associated with armed battles that might represent Civil War activity.

Historic Districts

We received numerous comments, including letters and public meeting statements, from the Nelson County Historic Society about possible project impacts on the Warminster Rural Historic District, a historic property located in Nelson County, Virginia that was determined eligible for listing in the NRHP in 2015. Atlantic surveyed the historic district for ACP and recommended that it retains sufficient integrity to remain eligible for listing; the VDHR agreed with this recommendation. Since Atlantic's survey, the Nelson County Historical Society filed a comment letter along with supporting material reporting that the VDHR Evaluation Committee approved an expansion of the NRHP-eligible boundary of the Warminster Rural Historic District. The newly drawn boundary now includes historic African-American properties, such as the Woodson Store, the Black Odd Fellows Hall, five cemeteries, and African-American homes. The pipeline corridor now crosses approximately 2.3 miles of the Warminster Historic District. Atlantic has committed to assess potential effects of ACP on the historic district, consult with the VDHR and other interested parties as needed, and make recommendations for further evaluation or mitigation of adverse effects.

We received comments about effects on the South Rockfish Rural Historic District, also in Nelson County, Virginia. The South Rockfish Rural Historic District includes 131 contributing resources and 117 noncontributing resources. It is significant for the periods 1737 to 1966 under the categories of Agriculture, Architecture, and Commerce, and has been determined eligible for NRHP listing by the VDHR. The current route would intersect the midsection of the South Rockfish Rural Historic District, and may affect individual properties that are eligible or listed in the NRHP. Atlantic surveyed the historic district and recommended that it retained sufficient integrity to remain eligible; the VDHR agreed with this recommendation. We asked Atlantic to consider the Spruce Creek Route Variation to avoid impacts on properties in the South Rockfish Rural Historic District. We received numerous comments opposing this alternative, mostly from landowners where the route variation would be located. As discussed in section 3.4.1, we evaluated the Spruce Creek Route Variation and concluded it would not offer a significant environmental advantage when compared to Atlantic's proposed route. Atlantic has committed to assess potential effects on the historic district, consult with the VDHR and other interested parties as needed, and make recommendations for further evaluation or mitigation of adverse effects.

We received comments about the Norwood-Wingina area and potential effects on historic sites. A 2014 study evaluated the cultural resources and recommended the boundaries for the Norwood-Wingina Rural Historic District, which the study recommended as eligible for listing in the NRHP. Subsequent to receipt of the comments, Atlantic incorporated a route modification that would avoid the Norwood-Wingina Rural Historic District, therefore, as the project corridor is currently designed, no effects on cultural resources in this historic district would occur.

Individuals and the Norfolk County Historical Society of Chesapeake commented about potential effects on the Sunray Agricultural Historic District within the City of Chesapeake, Virginia. This historic district, which was listed in the NRHP in 2007, is significant for its ethnic European heritage and agricultural community development. Atlantic proposes to use two access roads that extend into the Sunray Historic District. These roads are existing dirt-paved rights-of-way and would not be modified for ACP use. Atlantic concludes that there would be no effect on the historic district by use of these roads.

The Koontz family filed comments about their property known as "The Wilderness" in Bath County, Virginia (site number 008-0011). The historic farmstead meets the criteria for listing on the NRHP and includes a residence, numerous outbuildings, and agricultural fields. The VDHR commented that the property was determined eligible for listing on the NRHP in its review of the historic architecture survey report that documented the property. In addition, on June 15, 2017, the VDHR review boards approved the nomination of The Wilderness for listing on the Virginia Landmarks Registry and the NRHP. In response to our request for more information, Atlantic reported that the driveway that passes next to the main residence of The Wilderness has been removed from the project design for use as an access road. However, the pipeline is still located in the wooded and agricultural portions of the property. An assessment of effects and proposed mitigation for the historic property would be completed before project construction.

We received numerous comments regarding possible historic burials or cemeteries within the APE in Virginia. Property owners along Gully Tavern Road in Rice, Virginia expressed concerns about a family cemetery and unmarked graves. Atlantic responded that the survey of the APE in this area did not identify cemeteries or evidence of unmarked graves. The Old Dominion Appalachian Trail Club commented that the Lowe Family Cemetery was near the project corridor. Atlantic responded that this cemetery is 4 miles northeast of the project. Arthur T. Goodloe commented that his family mausoleum was near the project area. Atlantic responded that the project corridor passes 5.5 miles southwest of Mr. Goodloe's property.

As noted above, Atlantic identified 24 burials and historic cemeteries, some currently in use, in the APE in Virginia. Seven of these are associated with churches, and some are private cemeteries or individual burials. Atlantic conducted additional reconnaissance using pedestrian survey and probing using metal rods to identify any additional burials outside the known cemetery boundaries. Atlantic provided a cemetery delineation report for 10 cemeteries in the APE in Virginia. State laws protect burials and cemeteries from disturbance. Atlantic would avoid cemeteries and burials with an appropriate buffer during construction, and would file treatment plans identifying methods (e.g., fencing, vegetation buffers) to avoid impacts on cemeteries during construction. In addition, avoidance measures would be depicted on construction alignment sheets.

<u>Cultural Attachment</u>

We received multiple comments regarding cultural attachment. Letters filed on the docket and commenters at public meetings requested that the FERC assess the cultural attachment that residents of Nelson and Buckingham Counties experience, and consider whether this experience is threatened by ACP.

Historic preservation laws and regulations do not require an assessment of cultural attachment, and do not recognize a property type defined by cultural attachment. The laws do, however, recognize several property types that can convey the experience of cultural attachment, such as historic districts, historic landscapes, and traditional cultural properties. The FERC would review, in consultation with state and federal agencies as well as stakeholders, adverse effects on historic properties, including the historic districts in Nelson and Buckingham Counties. Because the historic districts are primarily comprised of aboveground structures, and the main facility of the project is an underground pipeline, the chief adverse effect to historic districts would be alteration of the setting such as the altered view because of the visible pipeline corridor. The setting of the rural Virginia counties is one of rolling hills, forests, small farm fields and widely spaced residences. The visible pipeline facilities such as Compressor Station 2 will be visible from the road, but largely obscured by the hilly and forested landscape. We do not anticipate any negative impacts on the rural community's cultural attachment to the landscape. See also the discussion of the Union Hill/Union Grove area in section 4.10.3.

North Carolina

Atlantic submitted separate reports for archaeology and historic architecture in North Carolina. As described in section 2.1, the portion of ACP in North Carolina includes the entire AP-2 mainline, a portion of the AP-3 lateral, Compressor Station 3 (in Northampton County), 3 M&R stations, 4 pig launcher/receiver facilities, 8 cathodic protection groundbeds, 7 communication towers, as well as off-corridor contractor yards and access roads.

Atlantic has completed surveys along portions of the AP-2 mainline and AP-3 lateral, as well as Compressor Station 3, the M&R stations, the pig launcher/receiver facilities, and seven groundbed locations. In addition to remaining surveys along the AP-2 mainline and AP-3 lateral, surveys have not yet been completed at the communication tower locations or one groundbed location. Numerous contractor yards and access roads have been surveyed, but project planning may require additional yards or roads, and added survey. Atlantic reports that it has surveyed 96.4 percent of the APE for direct effects and 100 percent of the APE for indirect effects to historic architecture. Atlantic will survey and report on the remaining 3.6 percent of the APE for direct effects.

In North Carolina, Atlantic recorded 67 cultural resources sites within the APE that are recommended as potentially eligible for listing in the NRHP, or have not been fully evaluated for eligibility, and cemeteries that are protected by state laws. This total includes 22 archaeological sites, 26 cemeteries (1 associated with the Halifax County Hospital, and 2 associated with private houses), 2 battlefields, 16 standing structures, and the Seaboard Railroad. Atlantic did not identify any locations in the APE that required deep testing in North Carolina. Atlantic is conducting additional surveys and evaluative testing to determine if sites that cannot be avoided meet the criteria for listing in the NRHP.

Atlantic's contractor ERM submitted an initial archaeology report and four addenda to the NCDNCR[34] for its review. The agency provided comments on four reports. In addition, Atlantic's contractor Dovetail Cultural Resources Group prepared an initial historic architecture survey report and one addendum. ERM produced a second, third, and fourth addendum survey report. ERM also met with the NCDNCR to clarify eligibility criteria for standing structures, and submitted a letter report documenting revised eligibility recommendations for sites CD1457 and CD1465. In these addenda reports, ERM committed to preparing a supplemental report that will summarize the work completed to date, identify those historic architecture resources that remain in the APE, and assess project effects to the historic properties.

ERM conducted evaluation testing at 27 archaeology sites in North Carolina. They recommended 7 sites as eligible for listing in the NRHP, 2 sites that do not have deposits contributing to eligibility in the APE, and 18 sites as not eligible. NCDNCR commented on one evaluation testing report, and concurred that three sites are not eligible and two sites are eligible for listing in the NRHP. Comments on the remaining 22 sites are pending.

Atlantic identified 26 cemeteries within the APE in North Carolina. Atlantic has committed to avoiding impacts on cemeteries and would avoid cemeteries and burials with an appropriate buffer during construction. Atlantic conducted additional survey at eight cemeteries and submitted a cemetery

[34] The NCDNCR serves as the North Carolina SHPO.

delineation report. The NCDNCR concurred with the findings in this report. Atlantic would file treatment plans identifying methods (e.g., fencing, vegetation buffers) to avoid effects on cemeteries during construction. In addition, avoidance measures would be depicted on construction alignment sheets.

Table 4.10.1-3 summarizes the cultural resources identified to date in North Carolina that are recommended eligible or potentially eligible for listing in the NRHP, are unevaluated for listing, or are cemeteries that would be avoided during construction. The table is based on numerous reports and other filings, and is the best data currently available. It is subject to changes while adjusting the project route and workspace, and additional cultural resources investigations.

Civil War Battlefields

The project APE intersects with two battlefields in North Carolina, the Averasborough Battlefield and the Bentonville Battlefield. The NCDNCR has not commented on historic battlefields in North Carolina to date.

4.10.1.2 Supply Header Project

DETI described the APE for direct project effects as the construction footprint where ground-disturbing activities are possible. DETI surveyed a 300-foot-wide linear corridor for the pipeline, 50-foot-wide corridor for access roads, and the footprint for other facilities and temporary workspaces. DETI described the APE for historic architecture (above ground) resources as the area for direct effects plus the surrounding areas within view of new construction, or changes to the landscape. The APE for the off-corridor facilities and workspaces was the footprint and the adjacent area in which visual, audible, and atmospheric effects could occur. The size of this APE varied according to the surroundings, but was generally within 500 feet of the pipeline corridor. DETI used survey methods mandated by the Pennsylvania and West Virginia SHPOs, including pedestrian survey of the entire route and shovel tests at locations with reduced ground visibility. DETI has surveyed 100 percent of the APE for historic architecture, and has surveyed 100 percent of the APE for archaeological resources in Pennsylvania. In West Virginia, DETI has surveyed 100 percent of all workspaces except for 0.2 percent of the pipeline corridor.

Pennsylvania

DETI completed cultural resources surveys for SHP in Pennsylvania, including a Phase I archaeological survey for the 3.9-mile-long TL-636 loopline, the JB Tonkin Compressor Station (in Westmoreland County), the Crayne Compressor Station (in Green County), the pig receiver facility, the pig launcher facility, along with contractor yards and access roads. DETI reported that it has surveyed 138.2 acres, which is the entire SHP project area in Pennsylvania for both archaeological and historic architecture resources.

DETI identified two historic archaeological sites that were previously recorded and determined not eligible for listing in the NRHP, and have since been destroyed. No new archaeological sites were identified during the initial SHP survey, and no locations in Pennsylvania were identified for possible deeply buried sites requiring deep testing. The Pennsylvania Bureau for Historic Preservation (PABHP)[35] concurred with the findings of the survey report and addenda, and no further work is recommended for those areas reported.

[35] The PABHP serves as the Pennsylvania SHPO.

TABLE 4.10.1-3

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in North Carolina

Site Name and Number	County	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
31CD2019	Cumberland	Prehistoric	Avoid untested portion of site outside workspace; avoidance plan pending	Potentially Eligible; portion of site in workspace Not Eligible	Pending after testing
31CD2055	Cumberland	Prehistoric	Avoid or Mitigate	Eligible, after testing	Concur; Pending after testing
31CD2091	Cumberland	Historic Cemetery	Avoid	Unknown	Pending; Cemetery treatment plan pending
31CD2100	Cumberland	Prehistoric	Avoid or Mitigate	Eligible after testing	Pending
31CD2106	Cumberland	Prehistoric	Avoid or Mitigate	Eligible after testing	Pending
31CD2118	Cumberland	Prehistoric	Phase II ongoing	Unevaluated	Pending
31CD2124	Cumberland	Prehistoric	Avoid site outside of APE	Eligible, portion in APE not contributing	Pending
31CD2126	Cumberland	Prehistoric	Phase II pending	Unevaluated	Pending
31CD2127	Cumberland	Prehistoric	Phase II pending	Unevaluated	Pending
31HX358	Halifax	Prehistoric	Phase II pending	Unevaluated	Pending
31HX478	Halifax	Prehistoric	Phase II pending	Unevaluated	Pending
31HX479	Halifax	Prehistoric	Phase II pending	Unevaluated	Pending
31JT423	Johnston	Prehistoric	Avoid or Mitigate	Eligible	Pending after testing
31JT437	Johnston	Historic Cemetery	Avoid	Unknown	Pending; Cemetery treatment plan pending
31JT452	Johnston	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
31JT461	Johnston	Historic Cemetery	Avoid	Unknown	Pending; Cemetery treatment plan pending
31JT465	Johnston	Prehistoric and Historic	Phase II ongoing	Unevaluated	Concur; Pending after
31JT470	Johnston	Prehistoric	Phase II ongoing	Unevaluated	Pending
31JT485	Johnston	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
31JT489	Johnston	Prehistoric	Phase II pending	Unevaluated	Pending
31JT491	Johnston	Prehistoric	Avoid site outside of APE	Unevaluated, portion in APE not contributing	Pending
31NS161	Nash	Unknown	Phase II ongoing	Unevaluated	Pending

TABLE 4.10.1-3 (cont'd)

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in North Carolina

Site Name and Number	County	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
31NS162	Nash	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
31NS171	Nash	Historic Cemetery	Avoid	Unknown	Pending; Cemetery treatment plan pending
31NS173	Nash	Historic Cemetery	Avoid	Unknown	Pending; Cemetery treatment plan pending
31NP388	Northampton	Historic Cemetery	Avoid	Not Eligible	Concur: Cemetery treatment plan pending
31NP391	Northampton	Prehistoric	Avoid or Mitigate	Eligible after testing	Concur
31NP392	Northampton	Prehistoric	Avoid or Mitigate	Eligible after testing	Concur
31RB515	Robeson	Prehistoric	Phase II pending	Unevaluated	Pending
31RB540	Robeson	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
31RB572	Robeson	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
31RB574	Robeson	Prehistoric	Phase II ongoing	Unevaluated	Pending
31WL351	Wilson	Prehistoric and Historic	Avoid or Mitigate	Eligible after testing	Pending
HT0131/ Averasborough Battlefield Historic District	Cumberland and Harnett	Historic Battlefield	Avoid or Mitigate	Eligible	Pending
CD1414	Cumberland	Historic Cemetery	Avoid	Not Eligible	Pending
CD1450/ Seaboard RR	Cumberland	Historic Railroad	Avoid or Mitigate	Eligible	Pending
CD1461	Cumberland	Historic Cemetery	Avoid	Not Eligible	Concur
CD1465	Cumberland	Historic House	Avoid or Mitigate	Eligible	Pending
CD1477	Cumberland	Historic Fire Tower	Avoid or Mitigate	Eligible	Pending
HX0021/ Halifax County Home and Hospital	Halifax	Historic Hospital and Cemetery	Avoid	Listed	Avoidance and Cemetery treatment plan pending
HX0227	Halifax	Historic Structures	Avoid or Mitigate	Eligible	Pending
HX0228	Halifax	Historic Structures	Avoid or Mitigate	Eligible	Pending
HX0229	Halifax	Historic Farmstead	Avoid or Mitigate	Eligible	Pending
HX1566	Halifax	Historic School	Avoid or Mitigate	Eligible	Pending

TABLE 4.10.1-3 (cont'd)

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in North Carolina

Site Name and Number	County	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
JT1355/ Bentonville Battlefield	Johnston	Historic Battlefield	Avoid or Mitigate	Listed	NA
JT1860	Johnston	Smithfield Fire Lookout Tower	Avoid or Mitigate	Eligible	Pending
JT1869/ Massengill Cemetery	Johnston	Historic Cemetery	Avoid	Not Eligible	Cemetery treatment plan pending
JT1920/ Stevens Sausage Company	Johnston	Historic Structure	Avoid or Mitigate	Eligible	Pending
JT1921/ Stevens Sausage Factory	Johnston	Historic Structure	Avoid or Mitigate	Eligible	Pending
JT1926	Johnston	Historic Structure	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
JT1929	Johnston	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
JT1935	Johnston	Historic Structure	Avoid Cemetery	Not Eligible	Pending
JT1936	Johnston	Historic Structure	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
JT1945	Johnston	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
JT1951	Johnston	Historic Structure	Avoid or Evaluate	Unevaluated, Inaccessible	Pending
JT1955	Johnston	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
NS0650/ May House	Nash	Historic House	Avoid or Mitigate	Eligible	Pending
NS1490	Nash	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
NS1493	Nash	Historic House	Avoid or Mitigate	Eligible	Pending
NS1523	Nash	Historic Cemetery	Avoid	Not Eligible	Pending
NP0488/ Faison Cemetery	Northampton	Historic Cemetery	Avoid	Not Eligible	Concur; Cemetery treatment plan pending
NP0534	Northampton	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending

TABLE 4.10.1-3 (cont'd)

National Register of Historic Places-Eligible and Unevaluated Cultural Resource Sites, and Cemeteries within the Atlantic Coast Pipeline Area of Potential Effects in North Carolina

Site Name and Number	County	Temporal/Cultural Association	Treatment Recommendation	Atlantic NRHP Eligibility Recommendation	SHPO Comment
NP0536	Northampton	House and Cemetery	Avoid Cemetery	Not Eligible	Pending; Cemetery treatment plan pending
SP0693	Sampson	Historic Cemetery	Avoid	Not Eligible	Pending; Cemetery treatment plan pending
SP0697	Sampson	Historic Cemetery	Avoid	Not Eligible	Pending
RB0678	Robeson	Historic Structures	Avoid or Mitigate	Eligible	Pending
RB0688	Robeson	House and Cemetery	Avoid Cemetery	Not Eligible	Pending; Cemetery treatment plan pending

DETI conducted a separate survey for historic architecture in Pennsylvania, and identified 19 properties over 50 years of age within the APE. DETI recommended that the 19 properties did not meet the criteria for listing in the NRHP. In an addendum report, DETI inventoried access roads and contractor yards and identified five additional properties, all of which were recommended as not eligible for listing in the NRHP. The PABHP concurred with DETI's recommendations except for one property (the Borland Farm [HS-22]). The agency requested additional archival research and historic aerial photos for this property and ultimately determined that the project would not have adverse effects to the property.

West Virginia

In West Virginia, DETI combined SHP surveys for archaeology and historic architecture into a single report and one addendum, and reported that it completed surveys for 31.2 miles of the TL-635 loopline, the Mockingbird Hill Compressor Station (in Wetzel County), the M&R station, the pig receiver facility, the pig launcher facility, along with off-corridor contractor yards and access roads. DETI completed the historic architecture survey of all project facilities in West Virginia (100 percent complete), and completed archaeological survey for all but a single parcel for project facilities (99.8 percent complete). DETI reported that the Burch Ridge Compressor Station in Marshall County does not require survey because the proposed improvements are limited to the existing footprint. Activities at the Hastings Compressor Station in Wetzel County would consist of abandoning in place two compressor units; as such, DETI did not do a cultural resources survey at that facility.

DETI revisited the location of two previously recorded historic archaeological sites in West Virginia and confirmed that both sites have been destroyed. DETI conducted Phase I surveys and Phase II evaluations in West Virginia. No locations within West Virginia were identified that require deep testing. DETI conducted Phase II testing at 46DO89 and recommended that the prehistoric component was eligible for NRHP listing. The WVDCH concurred with this finding, and added that the historic component was also eligible. If the site cannot be avoided, both components should be mitigated.

DETI identified 4 previously recorded historic architecture properties and inventoried 29 new properties during the current survey. Of these 33 sites, DETI recommended that the Randolph Farm, and the B&O Short Line, Fishing Creek Spur Railroad (two segments) are eligible for listing in the NRHP. DETI would avoid the 2 recommended eligible properties during construction.

DETI identified 3 cemeteries within the SHP APE in West Virginia. The Knights of Pythias Cemetery is within 100 feet of a proposed access road, but not within the permanent right-of-way, and therefore would not be affected by the project. The remaining two cemeteries, both associated with churches, will be avoided during project activities. DETI would avoid cemeteries and burials with an appropriate buffer during construction. Prior to construction, DETI would conduct additional reconnaissance using pedestrian survey and metal rod probing outside cemeteries within 150 feet of construction and other project workspace. DETI would file treatment plans identifying methods (e.g., fencing, vegetation buffers) to avoid effects on cemeteries during construction. In addition, avoidance measures would be depicted on construction alignment sheets.

Table 4.10.1-4 summarizes the cultural resources identified to date in the SHP APE in Pennsylvania and West Virginia that are recommended eligible or potentially eligible for listing in the NRHP, and cemeteries that would be avoided during construction. The table contains the best information available at this time, and may change during project planning. All cultural resources sites within the APE will be assessed for eligibility for listing in the NRHP, and reviewed by the relevant SHPO.

4.10.2 SHPO Consultations

Atlantic Coast Pipeline

Atlantic initiated consultations with the West Virginia, Virginia, and North Carolina SHPOs regarding ACP in 2014. Atlantic's initial letters to the WVDCH introduced the project, defined the APE, and described the survey methodology for cultural resources surveys. The WVDCH concurred with the proposed APE and survey methods. To date, the WVDCH has commented on ten survey reports and the *Unanticipated Discovery Plan* (see table 2.3.1-1). The agency did not concur with all of Atlantic's eligibility recommendations, requested additional information, and declined to comment on several resources until more information was provided. The WVDCH commented on the Phase II report on testing at 46PH775 and concurred that the portion of the site in the APE lacks research potential; however, the remainder of the site remains unevaluated. The WVDCH is waiting to review the comprehensive supplemental report on the historic architecture properties for the entire project APE in West Virginia.

In June 2014, Atlantic sent a letter to the VDHR introducing the project and presenting their proposed survey methods. In its response letter, the VDHR concurred with the proposed survey methods and specified that archaeological investigations within the drip line of caves or rock hangings are subject to the Cave Protection Act. Atlantic also consulted with VDHR about the FERC pre-filing process, permit applications, and field artifact analysis.

TABLE 4.10.1-4

National Register of Historic Places-Eligible and Potentially Eligible Cultural Resources, and Cemeteries within the Supply Header Project Area of Potential Effects

Site Number/ Name	State/County	Temporal/Cultural Association	Treatment Recommendation	DETI NRHP Recommendation	SHPO Comment
HS-22/ Borland Farm	PA/Westmoreland	Historic Farmstead	Per SHPO, no adverse effect from project	Not Eligible	Did not concur; Eligible
46DO89	WV/Doddridge	Prehistoric habitation/Historic Farmstead	Avoid or Mitigate	Prehistoric Component Eligible, Historic Component Not Eligible	Did not concur with Not Eligible recommendation for Historic Component
FN-6/ Randolph Farm	WV/Doddridge	Historic Log Cabin, Farmstead	No Effect/ Shielded by tree cover	Eligible	Concur
WZ-0025-0010, WZ-0036 B&O Short Line, Fishing Creek Spur	WV/Wetzel	Historic Railroad	Avoid by boring	Eligible	Concur
46DO90, Victory Baptist Church Cemetery	WV/Doddridge	Historic Cemetery	Avoid	Not Eligible	Concur; Cemetery treatment plan pending
HS-0884, Mount Lebanon Baptist Church and Cemetery	WV/Harrison	Historic Cemetery	Avoid	Not Eligible	Concur; Cemetery treatment plan pending
FN-29, Knights of Pythias Cemetery	WV/Wetzel	Historic Cemetery	Avoid; 100 feet from access road	Not Eligible	Concur; Cemetery treatment plan pending

To date, the VDHR has commented on four archaeological reports and the Virginia *Unanticipated Discovery Plan* (see table 2.3.1-1). The agency concurred with most of Atlantic's findings and recommendations, except for three sites that require further evaluation. The VDHR asked that unevaluated sites be treated as eligible until they can be fully evaluated, and stated that it would review cemetery avoidance plans. The VDHR reviewed reports for six historic architecture reports and concurred with most of the reports' findings. The VDHR did not concur with eligibility recommendations for four properties, and asked for additional information before commenting on several other properties (table 4.10.1-2). The VDHR comments on historic architecture report addenda 5 and 6 are pending, as are VDHR comments on Phase II testing reports.

Atlantic sent a letter to the NCDNCR in June 2014 introducing the project and describing the proposed field survey methods. Atlantic and its cultural resources contractor met with the NCDNCR to discuss the APE and archaeological survey methods. The NCDNCR provided comments on three archaeological reports, concurring with the most of the reports' findings and eligibility recommendations, but requesting additional information regarding survey methods and site recordation, and finding that seven sites recommended eligible do not meet the criteria for eligibility. In an email, the NCDNCR confirmed that deep testing was not required for those areas investigated to date. The NCDNCR reviewed two of the historic architecture reports submitted by Atlantic and requested revisions. The agency also provided comments on the historic architecture report addendum 2; it concurred with DETI's findings except for CD1457, a 1920 dwelling that did not meet the eligibility criteria. Following a meeting with the NCDNCR, DETI submitted revised eligibility recommendations for sites CD1457 and CD1465.

The NCDNCR commented on an Atlantic report on Phase II investigations at five sites in North Carolina. The agency concurred that two sites are eligible for listing on the NRHP and three sites are not eligible. NCDNCR's comments on other Phase II reports are pending. The NCDNCR also commented on a historic cemetery delineation report, concurring with the recommended avoidance measures.

Atlantic will continue to solicit comments from the three SHPOs on survey reports, testing reports, and treatment plans.

Supply Header Project

In October 2014, DETI sent the PABHP a letter introducing SHP and proposing an APE and survey methods. The PABHP replied that there was a high potential for the presence of significant archaeological sites within the project area. DETI submitted Phase I archaeological and historic architecture reports to the PABHP. The PABHP requested a revised Phase I archaeological report that showed the locations of shovel tests, which DETI provided. The PABHP concurred with the content and recommendations of the revised archaeology report, and addendum 1. The agency concurred with the historic architecture findings in the original report and addendum 1, except for the Borland Farm, which PABHP determined was eligible. The agency further determined that the project would have no adverse effects on the historic farmstead.

DETI sent a letter to the WVDCH in October 2014 introducing the project and presenting its proposed survey methods. WVDCH concurred with the proposed survey methods and requested an investigation of the alluvial soils in the project area to identify the potential for deeply buried archaeological sites.

In September 2015, DETI submitted a Phase I cultural resources survey report completed in West Virginia to the WVDCH. The agency concurred with the eligibility recommendations for the archaeology sites identified, but asked DETI to submit a revised report with additional analysis, which it did. The WVDCH concurred with the recommendations in the revised report. The WVDCH declined to provide comments on the architectural resources in the report, and requested more information about the ground clearance and viewshed, and impacts that might affect the historic architecture sites. DETI submitted a revised report, and the WVDCH concurred with the findings and recommendations in this report.

DETI conducted Phase II testing at site 46DO89 and submitted a report to the WVDCH that recommended the prehistoric component of the site as eligible for NRHP listing, but the historic component as not eligible. The WVDCH concurred with the eligibility recommendation for the prehistoric component, but did not concur with the not eligible recommendation for the historic component. The agency commented that if a data recovery is completed for the project, both historic and prehistoric components should be mitigated.

4.10.3 Communications with Other Agencies and the Public

The FS is reviewing the effects of ACP on the MNF and GWNF (which includes the ANST). The NPS manages the BRP. The status of surveys on federal lands is discussed in section 4.10.6.

The VDHR submitted comments requesting inclusion of additional consulting parties, and recommending methods for assessing the historic districts and Civil War battlefields that will be crossed by the project. For drilling operations at historic properties such as the BRP and the ANST, the agency requested contingency plans that address the potential for adverse effects to the historic properties in the event of drill failure.

In April 2016, the ACHP submitted a letter to us following inquiries it received regarding the project and compliance with section 106 of the NHPA. The ACHP was concerned about public outreach, and consideration of granting consulting party status to stakeholders. We responded with a letter describing the public outreach for the project, including Applicant-sponsored open houses, public scoping meetings, and receipt of more than 8,000 written comments. We considered requests for consulting party status according to the relevant regulations. For those groups and individuals that did not meet the consulting party criteria, we asked Atlantic to work with the SHPOs and assist interested stakeholders with obtaining privileged archaeological information on a case-by-case basis. The ACHP also wrote to us in April of 2017, again recommending consulting party status for certain stakeholders. The agency also concurred with the VDHR's letter regarding project impacts to three historic districts and five Civil War battlefields. The ACHP indicated it would participate in the execution of any agreement document prepared for the project.

The NPS commented on resources under its management, or of special concern to them, including the Captain John Smith National Historic Trail, which follows the Nansemond River in Suffolk, Virginia. Atlantic would cross the Nansemond River using the HDD method, which would avoid effects on the river and historic trail. The NPS is also consulting with Atlantic regarding the crossing of the NRHP-eligible BRP (see section 4.10.6). In a subsequent letter, the NPS stated that it had not been consulted under section 106, and requested consulting party status. We hereby accept the NPS' request to be a consulting party for ACP. The agency also requested additional mitigation measures to minimize visual effects to the BRP, and discussed amendments to the FS LRMP that might affect the ANST.

The Nelson County Historical Society, Augusta County Historical Society, Preservation Virginia, and the Rockfish Valley Foundation provided numerous comments regarding impacts on historic properties in Virginia. We asked Atlantic to provide additional information about properties in Nelson, Augusta, and Buckingham Counties in Virginia. The local organizations have requested copies of cultural resources investigation reports completed for the project in Virginia. These reports are not available to the public because they contain information about the location and significance of archaeological sites, protected by section 304 of the NHPA. Atlantic is assisting these stakeholders by consulting with the VDHR, which would coordinate the sharing of survey reports following the signing of confidentiality agreements with the organizations. The Nelson County Board of Supervisors was granted consulting party status in March of 2017.

Other organizations such as Friends of Nelson and the National Trust for Historic Preservation filed letters expressing concerns that interested parties were not granted consulting party status, and that conservation easements would be impacted, and that the project would be approved before historic properties were identified. Consulting party status is discussed in preceding paragraphs. Discussion of conservation easements is provided in section 4.8.

We received additional letters and comments at public meetings about the Union Hill and Union Grove locations near Compressor Station 2 located in Buckingham County, Virginia. Commenters expressed concerns that these locales represent the history of African-American settlement after the Civil War. We asked Atlantic to re-examine the properties located near Compressor Station 2. Atlantic resurveyed the location and expanded the visual APE to include additional properties. Atlantic recorded five properties, all houses with modest outbuildings on large lots and surrounded by hills, forests, and open spaces. Atlantic found that the buildings in the APE were non-farm structures built after World War II, and the overall landscape does not reflect the development of an agricultural community in the late nineteenth and early twentieth centuries. The visual APE does not exhibit a cohesive cultural landscape that would be threatened by construction of Compressor Station 2 and sub-surface pipeline.

As discussed above, Civil War battlefields are an important historic resource in the region of the proposed project. Atlantic and DETI consulted with staff from the Sailor's Creek Battlefield Historical

State Park, located 0.8 mile from the ACP APE, as well as other battlefield groups. All parties agreed that the AP-1 mainline would avoid core areas of the recorded battlefields. Assessment of potential impacts on Civil War battlefields is on-going.

4.10.4 Tribal Consultation

As the lead federal agency, we consulted with federally recognized American Indian tribes that may attach religious or cultural significance to historic properties that could be impacted by ACP and SHP. As described in section 1.3, our February 2015 NOI and two supplemental NOIs (August 2015 and May 2016) were sent to interested parties, including the following federally recognized American Indian tribes: Absentee-Shawnee Tribe of Oklahoma, Catawba Indian Nation, Cherokee Nation, Delaware Tribe of Indians, Delaware Nation, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Seneca Nations of Indians, Seneca-Cayuga Tribe of Oklahoma, Shawnee Tribe, Stockbridge Munsee Community, Tonawanda Band of Seneca Indians, Tuscarora Nation, and the United Keetoowah Band of Cherokee Indians. In addition to the NOIs, we sent two project update newsletters to the same tribes in June 2015 and August 2016.

In addition to our NOIs and project update newsletters, we sent letters requesting comments on the projects to the same 14 tribes in March 2015. In October 2015, we emailed the tribes to inform them that Atlantic and DETI filed their applications, including survey reports. In follow-up emails and phone calls beginning in June 2016, we learned that the Seneca Nation of Indians, the Catawba Indian Nation, the Delaware Tribe of Indians, the Eastern Shawnee Tribe of Oklahoma, the Tonawanda Band of Seneca Indians, and the Tuscarora Nation were interested in more information about the projects. We asked Atlantic to contact these tribes and send them project maps and survey reports as requested by them. Atlantic sent a letter seeking tribal input to the Catawba Indian Nation, the Delaware Tribe of Indians, the Tonawanda Band of Seneca Indians, and the Tuscarora Nation in August 2016. The Catawba Indian Nation responded with a letter stating that they have no immediate concerns regarding the projects, but would like to be notified if Native American artifacts or human remains are encountered during the ground disturbing phase of construction. The Delaware Nation informed us that the project does not endanger cultural or religious sites known to them, and asked that their office be included as a contact in the event of an unanticipated discovery during construction. The Eastern Band of the Cherokee Indians filed a letter on the docket requesting maps and copies of the archaeological survey reports of the project areas. Atlantic and DETI sent copies of all archaeological survey reports to the tribe. We will continue to consult with tribes who are interested in the projects and ensure they get the information they request.

During project planning, the Pamunkey Tribe of Virginia were confirmed as a federally recognized tribe. The tribe contacted us and requested the archaeology survey reports for Virginia. We asked Atlantic to provide the tribe with project reports and plans. On May 12, 2017 Atlantic provided the Pamunkey the requested information. We sent the tribe a copy of the DEIS, and will continue to consult with them.

Representatives of the Lumbee Tribe of North Carolina wrote letters and attended public meetings to express their concerns about possible project effects to their traditional territory in North Carolina. The tribe cited the 1956 Lumbee Recognition Act passed by the U. S. Congress. The tribe expressed concern that their traditional gathering places and locations for collecting medicinal plants may be destroyed. Two other North Carolina tribes, the Haliwa-Saponi, the Coharie, and the Meherrin also wrote to us about their traditional ties to areas along the project route in North Carolina, and requested that they be contacted if archaeological sites, including human remains, are encountered during project construction. We asked Atlantic to communicate with these tribes about possible impacts to sites important to them. Atlantic would also include tribal contact information in the unanticipated discovery plans for those tribes that request notification following a post-review discovery during construction.

Atlantic and DETI are assisting us with communicating project information to federally recognized American Indian tribes. In July 2014, they sent a letter introducing the projects and requesting comments to the same federally recognized tribes listed above. Atlantic's consultant followed up with an additional letter requesting comments in October 2014, and follow-up phone calls and emails. The Eastern Band of Cherokee Indians, the Delaware Nation, and the Stockbridge Munsee Community responded to Atlantic stating that they had no concerns about the project.

In May of 2017, Atlantic met with the representatives of seven tribes; Chickahominey Indian Tribe, Nottoway Tribe of Virginia, Pamunkey Indian Tribe, Upper Mattaponi Indian Tribe, Cheroenhaka (Nottoway) Indian Tribe, Mattaponi Indian Tribe, and Monacan Indian Nation. The tribes expressed concerns about unmarked burial sites and environmental impacts.

Additional discussion of tribal consultations for the portion of the project on federal lands is provided in section 4.10.6. A summary of Atlantic's and DETI's project correspondence with American Indian tribes is provided in appendix V.

4.10.5 Unanticipated Discovery Plans

Atlantic and DETI submitted *Unanticipated Discovery Plans* outlining the actions they would take if archaeological resources including human remains were inadvertently exposed during project construction (see table 2.3.1-1). Atlantic submitted separate *Unanticipated Discovery Plans* for construction within federal lands (see section 4.10.6 and table 2.3.1-1).

Several American Indian tribes commented that they should be contacted in the event of unanticipated discoveries during ground-disturbing project activities. We have recommended in section 4.10.7 that Atlantic and DETI provide revised *Unanticipated Discovery Plans* that include tribal contact information for those tribes that request notification following post-review discovery of archaeological sites, including human remains, during project activities.

Atlantic Coast Project

<u>West Virginia</u>

The WVDCH reviewed the *Unanticipated Discovery Plan* for West Virginia and provided Atlantic with the specific West Virginia state codes that applied, and clarified that Atlantic would be responsible to inform the appropriate county circuit court if human remains are discovered. Atlantic revised the plan accordingly and refiled it. We agree with the added clarifications and find the plan acceptable, pending communication with interested tribes.

<u>Virginia</u>

The VDHR reviewed the *Unanticipated Discovery Plan* to be used during construction in Virginia. The agency requested the addition of language about restricting the viewing of inadvertently discovered Native American burials or funerary objects, but otherwise approved the plan. Atlantic revised the plan and refiled it. We agree that the revised plan is acceptable, pending communication with interested tribes.

<u>North Carolina</u>

Atlantic submitted an *Unanticipated Discovery Plan* for North Carolina to the NCDNCR for its review. The agency responded in a comment letter that the procedures and contacts were in order, and we agree, pending communication with interested tribes. The Haliwa-Saponi Tribe, the Coharie Tribe, and the

Lumbee Tribe have historic ties to the project route in North Carolina, and asked to be notified in the event of the unanticipated discovery of an archaeology site or human remains in their traditional territory in North Carolina.

Supply Header Project

With their application filed in September 2015, DETI provided *Unanticipated Discovery Plans* for Pennsylvania and West Virginia. These plans outline the procedures to follow if unrecorded archaeological sites, including human remains, are inadvertently encountered during construction. These plans were also provided to the PABHP and the WVDCH.

Pennsylvania

DETI provided its *Unanticipated Discovery Plan* for SHP in Pennsylvania. To date, comments have not yet been received from the PABHP regarding the plan for Pennsylvania. DETI would file comments on the Plan from the PABHP, and would communicate with interested tribes.

West Virginia

The WVDCH reviewed the *Unanticipated Discovery Plan* and provided DETI with the specific West Virginia state codes that applied, and clarified that DETI will be responsible to inform the appropriate count circuit court if human remains are discovered. Atlantic revised the plan accordingly and refiled it. We agree that with the added clarifications. The plan is acceptable, pending communication with interested tribes.

4.10.6 Cultural Resources on Federal Lands

ACP would cross the MNF and the GWNF, both managed by the FS; the NRHP-eligible ANST would be crossed by ACP within the GWNF. ACP would also cross the BRP, located in the project APE in Augusta and Nelson Counties, Virginia, a property managed by the NPS.

Atlantic obtained permits in accordance with ARPA before surveying federal land. Atlantic consulted with the FS staff of the MNF and GWNF regarding survey methods, artifact curation, and plans for unanticipated discoveries on their respective national forests. The surveys conducted on federal land used the same APE and survey corridor for surveys completed on non-federal lands (300 feet centered on the pipeline centerline, and 50 feet centered on the mid-line of access roads). The federal land managers asked for a standalone report for each federal property, which Atlantic provided. The results of surveys on the MNF, GWNF, and BRP are summarized below.

The federal agencies met with Atlantic in August 2016 to discuss the proposed HDD crossings of the ANST and BRP. Both historic trails have been surveyed for cultural resources. Atlantic recommends that installation of the AP-1 mainline beneath these features using the HDD method, which would avoid direct long-term adverse effects to the NRHP-eligible trails.

Atlantic is assisting the MNF by sending copies of reports for surveys conducted within the national forest to the MNF tribal partners, as stipulated in the MNF ARPA permit. The MNF tribal partners are the Absentee-Shawnee Tribe of Indians of Oklahoma, Cayuga Indian Nation, Cherokee Nation of Oklahoma, Delaware Nation, Delaware Tribe of Indians, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Oneida Indian Nation of New York, Onondaga Nation of New York, Seneca Nation of Indians, Seneca-Cayuga Tribe of Oklahoma, Shawnee Tribe, Tonawanda Band of Seneca, Tuscarora Nation of New York, and the United Keetoowah Band of Cherokee Indians in Oklahoma. Atlantic sent the original and revised MNF survey reports to the MNF tribal partners; to date, no comments on the reports have been received.

Atlantic prepared separate *Unanticipated Discovery Plans* for the MNF and GWNF (see table 2.3.1-1). The FS reviewed plans and requested changes, notably that their offices be notified immediately in the event of the discovery of an archaeological site, including human remains during construction. Atlantic submitted revised *Unanticipated Discovery Plans* to the MNF and GWNF. The FS provided comments and its necessary modifications on November 27, 2015, December 11, 2015, and again on January 22, 2016. At the request of the FS, Atlantic also submitted the *Unanticipated Discovery Plan* to the MNF tribal partners; to date, no comments have been received.

Monongahela National Forest

ACP crosses the MNF in Pocahontas County, West Virginia. Atlantic surveyed 273 acres within the MNF, which included the entire direct APE. Atlantic located one previously recorded archaeological site within the APE, and recorded five new sites, all of which were isolated lithic flakes. No aboveground resources were recorded during surveys. Atlantic recommended that all sites recorded within the MNF APE are not eligible for listing in the NRHP. The FS submitted the Phase I survey report to the WVDCH, stating that the FS concurred with the report's findings and recommendations, and requesting the state agency's comments. The WVDCH concurred with the recommendations.

Additionally, from April 17 to April 20, 2017, GAI conducted fieldwork along Buzzard Ridge road and east of Route 92, near Michael Mountain. Daily updates suggest that no historic properties were present along these roads, but the MNF is still waiting to receive a formal technical report from GAI. The forthcoming report will also contain more specific locational information for this fieldwork.

On May 25 and 26, 2017, the MNF received shapefiles that depicted (1) a slightly different placement of the Buzzard Ridge access road, where it extends westward from the centerline between mileposts 71.6 and 71.7; and (2) a set of 25 access road modifications and 4 culverts. It is unclear at this time whether these new additions will require new archaeological surveys. The aforementioned technical report that is still pending should provide clarity.

George Washington National Forest

ACP crosses the GWNF in Highland, Bath, and Augusta Counties, Virginia. After consulting with the GWNF staff, Atlantic completed surveys of the route in the APE, totaling 551.7 acres. As reported, they completed shovel testing along 29 percent of the APE. Atlantic recorded four new prehistoric archaeological sites, two new historic archaeological sites, and six new prehistoric isolated finds. In addition, two previously recorded prehistoric sites were relocated during surveys. No standing structures were recorded. Atlantic recommended that three sites are potentially eligible for listing in the NRHP. No standing structures were reported in the APE; however, the route intersects the ANST within the GWNF in Augusta County. The FS provided comments on the Phase I survey on August 10, 2016 with approval of the survey work and approval to conduct additional Phase II testing on the three sites recommended for evaluation. The FS also requested further investigations for sites 44AU0780, 44AU0914, and 444AU0915. The VDHR concurred with the report's findings and the FS recommendations for additional testing.

Atlantic completed the Phase I survey of the remaining 104.4 acres in the APE and reported the identification of seven newly recorded archaeological sites: two prehistoric lithic scatters, four prehistoric isolated finds, and a series of historic stone box culverts, recorded as a single site. Atlantic recommended these seven sites as not eligible for listing on the NRHP. The survey identified one historic architecture site, the Duncan Knob Lookout Tower, which Atlantic recommends as eligible for NRHP listing. Table

4.10.6-1 summarizes the cultural resources sites (excluding isolated finds) within the GWNF APE and the results of Atlantic's survey and testing.

TABLE 4.10.6-1

Cultural Resource Sites within the Atlantic Coast Pipeline Area of Potential Effects in the George Washington National Forest

Site Number	County	Temporal/Cultural Association	Phase II Treatment Recommendation	Atlantic Phase II NRHP Eligibility Recommendation	FS Comment on Phase II report
44AU0781	Augusta	Prehistoric Lithic Scatter	Protective fencing to avoid site outside of APE[a]	Potentially Eligible	Pending
44AU0917	Augusta	Prehistoric Lithic Scatter, possible Quarry/ Historic hearth and artifact scatter	Protective fencing to avoid site outside of APE[a]	Potentially Eligible	Pending
44AU0918	Augusta	Prehistoric Lithic Scatter	Protective fencing to avoid site outside of APE[a]	Potentially Eligible	Pending
44AU0780	Augusta	Prehistoric Lithic Scatter	None	Unevaluated	Pending
44AU0914	Augusta	Prehistoric Lithic Scatter	None	Not Eligible	Pending
44AU0915	Augusta	Prehistoric Lithic Scatter	None	Not Eligible	Pending
44BA0941	Bath	Prehistoric Lithic Scatter	None	Not Eligible	Pending
44BA0492	Bath	Prehistoric Lithic Scatter	None	Not Eligible	Pending
44BA0493	Bath	Historic Stone Culverts	None	Not Eligible	Pending
Not part of Phase II Testing					
021-5012	Augusta	Historic Trail	Avoid using HDD	Eligible	Pending
008-5071	Bath	Historic Duncan Knob Lookout Tower	No effects	Eligible	Pending

[a] Active Monitoring of the site areas by FS archaeologists for avoidance during construction will be required.

Atlantic filed an ARPA permit application with the GWNF in August 2016, requesting approval to conduct evaluative field testing on the three sites recommended eligible in their survey report. According to the permit application, the GWNF asked Atlantic to conduct testing on three prehistoric sites consisting that Atlantic recommended not eligible (site numbers 44AU0780, 44AU0914, and 44AU0915). Following GWNF approval of its ARPA permit, including the Phase II testing plans, Atlantic conducted fieldwork at the six archaeological sites. Phase II testing methods included systematic shovel probing and excavation of 1-meter by 1-meter test units. Following Phase II testing, Atlantic recommends that sites 44AU0914 and 44AU0915 are not eligible. Site 44AU0780, and sites 44AU0781, 44AU0917, and 44AU0918, are unevaluated until Phase II investigations are completed. The VDHR concurred with the FS findings and eligibility determinations.

As of this time Phase II investigations are ongoing and awaiting results. Currently, the ACP has the potential to adversely affect historic properties on the GWNF. Atlantic has completed a Phase I inventory of the proposed route and is finalizing work on the Phase II evaluations of the cultural resources identified during the Phase I to determine which may qualify as historic properties. For those historic properties that cannot be avoided by ACP, an adverse effect assessment will be made in accordance with 36 CFR 800.5, and a section 106 MOA will be negotiated to mitigate adverse effects per 36 CFR 800.6.

Regarding the ANST, this property was previously determined eligible for the NRHP (Reeve et al., May 2016). Atlantic proposes to mitigate adverse effects on the trail by boring under it. However, according to guidelines established under 36 CFR 800.5: Assessment of Adverse Effects, paragraph 2, subpart 5, the FS finds that ACP would have a temporary adverse effect on the ANST during the boring operations due to the introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

Blue Ridge Parkway

ACP would cross the NRHP-eligible BRP for 0.1 mile at the border between Augusta and Nelson Counties, Virginia. Following consultation with the NPS and issuance of an ARPA permit, Atlantic surveyed a total of 9.7 acres of the BRP crossing, including the 300-foot-wide corridor and a 400-foot-wide ATWS. No cultural sites were identified. As discussed above, Atlantic would install the pipeline beneath the BRP using the HDD method; therefore, Atlantic recommends that there would be no direct effects on the BRP. Atlantic sent the report documenting surveys at the BRP crossing to the NPS along with the *Unanticipated Discovery Plan* for review. The NPS commented that they were satisfied with the report's findings. They did not comment on the *Unanticipated Discovery Plan*.

4.10.7 Compliance with the National Historic Preservation Act

Compliance with section 106 of the NHPA has not been completed for ACP and SHP. Atlantic and DETI still need to complete cultural resources surveys of proposed project areas and treatment plans for NRHP-eligible sites that cannot be avoided. For all burials and cemeteries in the project APE, Atlantic and DETI would submit treatment plans that detail the measures that will be used during project activities to avoid impacts on these resources. Treatment plans would be reviewed and approved by the appropriate parties including the FERC, the SHPOs, interested tribes, and the federal land managers for federal lands. The FERC would afford the ACHP an opportunity to comment in accordance with 36 CFR Part 800.6. Implementation of a treatment plan would only occur after certification of the projects (if they are reviewed and found acceptable by the Commission) and the FERC provides written notification to proceed. To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Atlantic and DETI should <u>not begin</u> construction of ACP and SHP facilities or use of contractor yards, ATWS, or new or to-be-improved access roads <u>until</u>:**

  a. Atlantic files with the Secretary documentation of communications with the Lumbee Indian Nation, Coharie Tribal Council, Haliwa-Saponi Tribe, and the Meherrin Tribe regarding traditional tribal sites, including natural resources gathering locations in the project area.

  b. Atlantic and DETI file with the Secretary:

    i. all survey reports, evaluation reports, reports assessing project effects, and site treatment plans, and cemetery avoidance treatment plans;

    ii. comments on all reports and plans from the Pennsylvania, West Virginia, Virginia, and North Carolina SHPOs, the MNF, GWNF, and NPS, as well as any comments from federally recognized Indian tribes, and other consulting parties, as applicable; and

iii. revised *Unanticipated Discovery Plans* that include tribal contact information for those tribes that request notification following post-review discovery of archaeological sites, including human remains, during project activities;

c. the ACHP is afforded an opportunity to comment if historic properties would be adversely affected; and

d. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Atlantic and DETI in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

All material filed with the Commission that contains location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering "CUI//PRIV – DO NOT RELEASE."

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

This section of the EIS describes existing air quality; identifies the construction and operating air emissions and projected air quality impacts; and outlines methods that would be used to achieve compliance with regulatory requirements for ACP and SHP.

Temporary air emissions would be generated during project construction, which would occur over a period of about 2 years and across four states; however, most air emissions associated with ACP and SHP would result from the long-term operation of the new and modified compressor stations. Construction and operation air emissions and mitigation measures are discussed in section 4.11.1.3.

4.11.1.1 Existing Air Quality

Regional Climate

ACP and SHP would be constructed in the continental Northeast (West Virginia, Pennsylvania) and Southeast (North Carolina, Virginia) portions of the United States. The Northeast region has four distinct seasons, each of which can produce potentially dangerous storms. Large temperature and precipitation extremes are common in the region, although precipitation is generally distributed evenly throughout the year. The Northeast averages about 40 inches of precipitation annually, with between 17 and 37 inches of snowfall. Average daily temperatures are generally lowest in January and highest in July. Summers are warm and humid, with temperatures in excess 90 °F, and tend to be the rainiest season. During winter months, the average temperatures range from 8 °F to 35 °F, with occurrences of temperatures below 0 °F. Snowstorms and blizzards occur during winter months and droughts, tornadoes, and thunderstorms are characteristic of the region during the other seasons (NOAA, 2013a). In the Southeast, summers are characteristically warm and moist/humid with frequent thundershowers. Virginia and the Carolinas receive an average of 40 to 50 inches of precipitation annually, although precipitation in Southwestern North Carolina exceeds 100 inches annually. The northern portion of the Southeast averages 5 to 25 inches of snowfall annually; however, at higher elevations (Appalachians), snowfall can exceed 100 inches annually. Average minimum temperatures in North Carolina and Virginia range from about 18 °F to 36 °F. In July, average maximum temperatures range from 76 °F to 90 °F. Since 1980, the Southeast has experienced more billion-dollar weather disasters than any other region, primarily due to hurricanes, tornadoes, and floods (NOAA, 2013b).

Ambient Air Quality Standards

Ambient air quality is protected by federal and state regulations. The EPA has established the National Ambient Air Quality Standards (NAAQS) to protect human health and welfare. The NAAQS include primary standards that are designed to protect human health, including the health of "sensitive" individuals such as children, the elderly, and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including visibility, vegetation, animal species, economic interests, and other concerns not related to human health. We received comments regarding the impact of compressor station emissions on public health. These are discussed below.

Standards have been set for seven principal pollutants that are called "criteria pollutants." These criteria pollutants are ground-level ozone, carbon monoxide (CO), oxides of nitrogen (NO_X), sulfur dioxide (SO_2), fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM_{10}] and $PM_{2.5}$), and airborne lead. Ozone is not emitted into the atmosphere from an emissions source; it develops as a result of a chemical reaction between NO_X and VOC in the presence of sunlight. Therefore, NO_X and VOCs are often referred to as ozone precursors and are regulated to control the potential for ozone formation. The current NAAQS are listed on the EPA's website at www.epa.gov/criteria-air-pollutants/naaqs-table (EPA, 2016b).

Air quality control regions (AQCR) are areas established by the EPA and local agencies for air quality planning purposes, in which State Implementation Plans describe how the NAAQS would be achieved and maintained. The AQCRs are intra- and interstate regions such as large metropolitan areas where improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. Each AQCR, or smaller portion within an AQCR (such as a county or multiple counties), is designated, based on compliance with the NAAQS, as attainment, unclassifiable, maintenance, or nonattainment, on a pollutant-by-pollutant basis. Areas in compliance, or below the NAAQS, are designated as attainment, while areas not in compliance, or above the NAAQS, are designated as nonattainment. Areas previously designated as nonattainment that have since demonstrated compliance with the NAAQS are designated as maintenance for that pollutant. Maintenance areas may be subject to more stringent regulatory requirements similar to nonattainment areas to ensure continued attainment of the NAAQS. Areas that lack sufficient data are considered unclassifiable and are treated as attainment areas. ACP and SHP counties designated as nonattainment and maintenance with the NAAQS are shown in table 4.11.1-1 (EPA, 2015). All other counties crossed by the projects are in attainment with the NAAQS.

TABLE 4.11.1-1

Status of Affected Counties Designated Nonattainment and Maintenance

State	County	Nonattainment	Maintenance
West Virginia	Marshall	2010 24-hour SO_2	1997 $PM_{2.5}$ 1997 8-hour Ozone[a]
Virginia	Suffolk	-	1997 8-hour Ozone
	Chesapeake	-	1997 8-hour Ozone
North Carolina	Nash	1997 8-hour Ozone	-
	Johnston	1997 8-hour Ozone	-
Pennsylvania	Westmoreland	1997 8-hour Ozone 2008 8-hour Ozone	1997 $PM_{2.5}$ 2006 24-hour $PM_{2.5}$
	Greene	2006 24-hour $PM_{2.5}$ 1997 8-hour Ozone	

[a] The 1997 8-hour ozone NAAQS were revoked April 6, 2015.

The EPA now defines air pollution to include the mix of six long-lived and directly emitted greenhouse gases (GHG), finding that the presence of the following GHGs in the atmosphere may endanger public health and welfare through climate change: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. As with any fossil-fuel fired project or activity, ACP and SHP would contribute GHG emissions. The principle GHGs that would be produced by the projects are CO_2, CH_4, and N_2O. No fluorinated gases would be emitted by the projects. GHG emissions are quantified and regulated in units of CO_2 equivalents (CO_2e). The CO_2e takes into account the global warming potential (GWP) of each GHG. The GWP is a ratio relative to CO_2 of a particular GHG's ability to absorb solar radiation as well its residence time within the atmosphere. Thus, CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298 (U.S. Global Change Research Program, 2014).[36] We received comments on the amount and impacts of GHG emission the projects would contribute. In compliance with the EPA's definition of air pollution to include GHGs, we have provided estimates of GHG emissions for construction and operation, as discussed throughout this section. Impacts from GHG emissions (i.e., climate change) are discussed in more detail in section 4.13.3.12.

Air Quality Monitoring and Existing Air Quality

Most operational emissions from ACP and SHP would result from operation of the compressor stations. The EPA as well as state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. Data were obtained from representative air quality monitoring stations to characterize the background air quality for each compressor station and are presented in tables 4.11.1-10 and 4.11.1-12 in combination with ACP and SHP impacts for comparison with the NAAQS.

4.11.1.2 Air Quality Regulatory Requirements

New Source Review

New Source Review (NSR) is a preconstruction permitting program designed to protect air quality when air pollutant emissions are increased either through the modification of existing stationary sources or through the construction of a new stationary source of air pollution. Proposed new or modified air pollutant emissions sources must undergo a NSR permitting process prior to construction or operation. Through the NSR permitting process, federal, state, and local regulatory agencies review and approve project construction plans, and regulate pollutant increases or changes, emissions controls, and other details. The agencies then issue construction permits that include specific requirements for emissions control equipment and operating limits. PSD could potentially apply to stationary emissions sources, such as compressor stations, but does not apply to pipeline operation. PSD regulations were not designed to prevent sources from increasing emissions, but to protect public health and welfare and air quality in national parks, wilderness areas, and other areas of national or regional recreational, scenic, or historic value. PSD regulations also ensure that any decision to permit increased air pollution in any area to which these regulations apply is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision-making process.

In areas with good air quality, NSR ensures that the new emissions do not degrade the air quality, which is achieved through the implementation of the PSD permitting program or state minor permit programs. In areas with poor air quality, Nonattainment NSR (NNSR) ensures that the new emissions do

[36] These GWPs are based on a 100-year time period. We have selected their use over other published GWPs for other timeframes because these are the GWPs that the EPA has established for reporting of GHG emissions and air permitting requirements. This allows for a consistent comparison with these regulatory requirements.

not inhibit progress toward cleaner air. The review process aids in preventing new sources from causing existing air quality to deteriorate beyond acceptable levels.

ACP's proposed new Compressor Stations 1, 2, and 3 would be subject to a PSD major source threshold of 250 tons per year (tpy). For each pollutant that triggers PSD, a Best Available Control Technology (BACT) analysis and detailed dispersion modeling must be performed. Table 4.11.1-7 provides the potential operational emissions for ACP compressor stations. Because emissions of criteria pollutants would not exceed 250 tpy, ACP would not trigger PSD requirements.

A modification to an existing major source is considered major if it results in a net emissions increase that exceeds the following thresholds: 40 tpy for NO_x and SO_2; 100 tpy for CO; 25 tpy for PM; 15 tpy for PM_{10}; and 10 tpy for $PM_{2.5}$. For ozone, the major modification threshold is 40 tpy of precursors VOC or NO_x.

Table 4.11.1-9 provides the potential operational emissions for SHP compressor stations. Potential operational emissions from the existing Crayne and JB Tonkin Compressor Stations after the proposed modifications would remain below PSD major source thresholds; therefore, these stations would not be subject to PSD regulations.

DETI's existing Mockingbird Hill, Hastings, and Lewis Wetzel Compressor Stations currently operate under a single Title V Operating Permit. The potential-to-emit emissions from these existing compressor stations combined exceed 250 tpy for NO_x and VOCs and is, therefore, a major source under PSD. Modifications to these facilities must be analyzed to determine whether any would be a major PSD modification. Table 4.11.1-2 provides the potential emission increases associated with the proposed modifications at the existing Mockingbird Hill Compressor Station, and the proposed nonjurisdictional modification at the existing Hastings Compressor Station.

TABLE 4.11.1-2

Mockingbird Hill and Hastings Compressor Station Emission Increases (tons per year)

Proposed Action	NO_X	CO	VOC	SO_2	Total PM_{10} / $PM_{2.5}$	CO_2e
Mockingbird Hill Expansion	55.5	58.6	17.3	5.17	30.6	197,797
Hastings Replacement Engines	8.6	17.2	6.1	0.02	1.65	5,182
Total	64.1	75.8	23.4	5.2	32.3	202,979
PSD Threshold	40	100	40	40	15/10	75,000
Significant Increase?	**Yes**	No	No	No	**Yes**	**Yes**

Based on table 4.11.1-2 above, emissions of NO_x, CO_2e, PM_{10}, and $PM_{2.5}$ would exceed the major source modification thresholds, triggering PSD. The next phase of PSD applicability is to consider contemporaneous changes at the site. Because the Mockingbird Hill, Hastings, and Lewis Wetzel Compressor Stations are permitted as a single source, contemporaneous emissions changes from all facilities were considered. DETI considered three past projects in its review of contemporaneous emissions changes:

- construction of the Lewis Wetzel Compressor Station (additional 19.6 tpy of NO_x);
- modification of the dehydration unit and associated equipment at the Hastings Compressor Station (reduction of 1.03 tpy of NO_x); and
- the planned replacement of two the two reciprocating engines at the Hastings Compressor Station (reduction of 194 tpy of NO_x).

The three past projects combined would result in a decrease of about 176 tpy in NO_x emissions. When considered with the proposed modification under SHP, which alone would increase the existing NO_x emissions by 55.5 tpy, the total net NO_x emissions at the site would be reduced by 112 tpy. PSD applicability for the Mockingbird Hill Compressor Station is shown in table 4.11.1-3 below.

TABLE 4.11.1-3

Prevention of Significant Deterioration Determination for the Mockingbird Hill Compressor Station

	NO_X	CO	VOC	SO_2	$PM/PM_{10}/PM_{2.5}$	CO_2e
	(tons per year)					
Mockingbird Hill (Wetzel County, West Virginia)	55.5	58.6	17.3	5.17	30.6	197,797
Other Contemporaneous Changes	(167)					
Significant Net Emissions Increase	(112)					
PSD Threshold (Major Modification)	40.0	100.0	40.0	40.0	25.0/15.0/10.0	75,000 [a]
Significant Increase?	No	No	No	No	**Yes**	**Yes** [a]

[a] Only after another pollutant triggers PSD.

When considering contemporaneous emissions changes, the modifications at the Mockingbird Hill Compressor Station would be minor. However, based on table 4.11.1-3, the net emissions increase of PM, PM_{10}, $PM_{2.5}$, and GHGs would still exceed the major modification thresholds, representing a significant net emissions increase. Therefore, a BACT analysis is required per PSD regulations.

GHG BACT Analysis

The GHG BACT analysis for the Mockingbird Hill Compressor Station included review of the following technologies and practices:

- carbon capture from the turbine stacks and permanent sequestration (CCS);
- selection of natural gas compression process efficiency improvements;
- selection of low carbon fuel; and/or
- good combustion/operating practices (to optimize operating efficiency).

DETI determined that carbon capture and sequestration was deemed technically infeasible due to the need for high voltage power transmission lines and additional electrical load to operate a CCS system. The additional power requirements would also increase CO_2 emissions. An increased footprint at the site would be required to facilitate CCS technology (which could include an amine scrubber). The turbines would be unable to provide the required horsepower due to increased backpressure.

In its permit application, DETI states that it would implement the remaining three practices listed above. Installation of the proposed combustion engine, as opposed to multiple smaller reciprocating engines, constitutes the most efficient compressor drive. Pipeline quality natural gas, which has the lowest GHG emissions compared to other fossil fuels, would be used to fuel the combustion turbines. Good combustion and operating practices include proper maintenance and monitoring, as well as automatic controls via computer systems that routinely adjust turbine operations to maintain safe and high efficiency operation.

Particulate Matter BACT Analysis

DETI evaluated BACT for PM_{10} and $PM_{2.5}$ as part of its application for the Mockingbird Hill Compressor Station. DETI indicates that it would utilize pre-combustion control technologies, including clean-burning, low sulfur fuels, good combustion practices, and high efficiency filtration of the combustion turbine inlet system, to control particulate matter emissions.

DETI analyzed post-combustion control technologies, including cyclones/centrifugal collectors, fabric filters/baghouses, electrostatic precipitators, and scrubbers. These technologies are more effective at removing larger particles (10 microns or larger) and would not be efficient at removal of $PM_{2.5}$. During the air permitting process, the WVDEP would evaluate whether DETI's BACT analysis is appropriate and complete.

Federal Class I Areas

During the PSD review process, the potential impact of a project on protected Class I areas must also be considered. Federal Class I areas are designated as pristine natural areas or areas of natural significance, including national parks and some FS wilderness areas, and are afforded special protection under the CAA. If a facility is subject to PSD requirements and near a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the facility on the Class I area to ensure pristine air quality is maintained.

The Mockingbird Hill Compressor Station is approximately 70 miles (about 113 kilometers) northeast of the Otter Creek Wilderness Class I area and 80 miles (about 129 kilometers) northeast of the Dolly Sods Wilderness Class I area. Both wilderness areas are managed by the FS. Because the Mockingbird Hill Compressor Station is more than 100 kilometers away from these Class I areas, an assessment of the impact on these Class I areas is not required. However, the WVDEP may be responsible for notifying the federal land manager and determining any needed additional analysis, as part of the PSD permitting process.

The NPS requested that Atlantic and DETI analyze the impacts of ACP and SHP on the Shenandoah National Park in Virginia, because Compressor Station 2 would be sited within the state (Buckingham County). While Compressor Station 2 would be within 100 kilometers of the Shenandoah National Park, because it would be a minor source under PSD, an air quality impacts analysis on the Shenandoah National Park is not required. Compressor Station 2 would also be within 100 kilometers of the James River Face Wilderness Area. This station would be a minor source under PSD regulations, and an air quality impacts analysis on this area would not be required.

The remaining ACP and SHP compressor stations would be minor sources of emissions under PSD regulations and would not be subject to the rule; therefore, an impacts analysis on nearby Class I areas is not required. As indicated above, pipelines are not considered stationary sources of emissions and are not subject to PSD regulations or impacts analyses on protected Class I areas.

Title V Operating Permitting

Title V is an operating permit program run by each state. The major source threshold level for an air emission source is 100 tpy for criteria pollutants in attainment areas. The major source hazardous air pollutant (HAP) thresholds for a source are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate. The EPA issued the Title V GHG Tailoring Rule, which established permitting requirements and thresholds for GHGs. On June 23, 2014, the U.S. Supreme Court ruled that a facility may not be required to obtain a Title V permit based solely on GHG emissions; however, if a facility is a major stationary source based on the potential-to-emit of other regulated pollutants, a Title V permit may include permit requirements for GHGs.

The potential-to-emit at the new ACP compressor stations would be below the Title V thresholds and would not be subject to Title V.

For SHP, the existing Mockingbird Hill and JB Tonkin Compressor Stations are currently subject to Title V regulations and would remain Title V facilities after modification. The Crayne Compressor Station, authorized under a state operating permit, is a minor source under Title V and would remain so after construction of SHP.

New Source Performance Standards

The EPA promulgates NSPS that establish emission limits and fuel, monitoring, notification, reporting, and recordkeeping requirements for new or significantly modified stationary source types or categories. NSPS Subpart JJJJ (*Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*) sets emission standards for NO_X, CO, and VOC. Subpart JJJJ would apply to the emergency generators at each of the new and modified ACP and SHP compressor and M&R stations. Atlantic and DETI would comply with all applicable requirements of Subpart JJJJ. Subpart KKKK, *Standards of Performance for Stationary Combustion Turbines*, regulates emissions of NO_X and SO_2. This subpart would apply to the new and modified compressor units installed at ACP and SHP compressor stations. Atlantic and DETI would be required to comply with applicable emission limits and monitoring, reporting, and testing requirements of this subpart.

National Emission Standards for Hazardous Air Pollutants

The CAA Amendments established a list of 187 HAPs, resulting in the promulgation of National Emission Standards for Hazardous Air Pollutants for Source Categories (NESHAP). NESHAPs regulate HAP emissions from stationary sources by setting emission limits, monitoring, testing, recordkeeping, and notification requirements. Subpart ZZZZ (*National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*) would apply to the emergency electrical power generators at each compressor station. Atlantic and DETI would be subject to all applicable Subpart ZZZZ monitoring, recordkeeping, and reporting requirements and/or would comply with NESHAPs Subpart ZZZZ by complying with NSPS Subpart JJJJ requirements.

On May 12, 2016, the EPA issued three final rules, including the *Final Updates to New Source Performance Standards* and *Final Source Determination Rule*, that together will curb emissions of CH_4, smog-forming VOCs, and toxic air pollutants from new, reconstructed, and modified oil and gas sources. The final rules limit CH_4 emissions from oil and gas sources. For example, owners/operators are required to monitor and repair leaks on an established schedule to limit fugitive emissions, and emissions limits have been established for certain natural gas facilities. Regarding natural gas transmission facilities, compressor station owner/operators are required to develop a leak monitoring plan and use an optical gas imaging (or an alternate EPA method, "Method 21") to conduct leak surveys. On October 20, 2016, the EPA also issued its *Control Techniques Guidelines for the Oil and Natural Gas Industry* to inform state, local, and tribal agencies on what constitutes reasonably available control technology. Atlantic and DETI would be required to comply with all applicable standards and requirements set forth by these final rules.

General Conformity

The General Conformity Rule was developed to ensure that federal actions in nonattainment and maintenance areas do not impede states' attainment of the NAAQS. A conformity determination must be conducted by the lead federal agency if a federal action's construction and operation activities are likely to result in generating direct and indirect emissions that would exceed the conformity applicability threshold level of the pollutant(s) for which an air basin is designated as nonattainment or maintenance. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

The General Conformity Rule entails both an applicability analysis and a subsequent conformity determination, if applicable. According to the conformity regulations, emissions from sources that are subject to any NNSR or PSD permitting/licensing (major or minor) are exempt and are deemed to have conformed. A General Conformity Determination must be completed when the total direct and indirect emissions of a project would equal or exceed the specified pollutant thresholds on a calendar year basis for each nonattainment or maintenance area.

For the proposed projects, all non-permitted emissions that would occur within a nonattainment area were considered in the general conformity applicability analysis.[37] Table 4.11.1-4 provides the results of the general conformity applicability review for ACP and SHP. Based on these results, the operational emissions that would occur in nonattainment or maintenance areas would not exceed the general conformity applicability thresholds for any criteria pollutant in a single calendar year. Therefore, general conformity does not apply to ACP or SHP. Likewise, construction emissions occurring in nonattainment counties would be below the applicable *de minimis* levels; therefore, a general conformity analysis is not required.

TABLE 4.11.1-4

General Conformity Applicability Analysis for the Atlantic Coast Pipeline and Supply Header Project

County (State)	Nonattainment Pollutant	NO_X (tons per year)	VOC	SO_2	$PM_{2.5}$
Calendar Year 2018					
	Southwest Pennsylvania Interstate Air Quality Control Region				
Greene (PA)	$PM_{2.5}$ 24-hr (2006)	9.72	1.71	0.0015	3.61
Westmoreland (PA)	Ozone 8-hr (2008) $PM_{2.5}$ 24-hr (2006)	77.9	13.2	0.139	25.8
Air Region Total		**87.6**	**14.9**	**0.154**	**29.4**
	PA General Conformity de minimis	*100*	*50*	*100*	*100*
	Steubenville-Weirton-Wheeling Interstate Air Quality Region				
Marshall (WV)	SO_2 24-hr (2010)	N/A	N/A	0	N/A
Air Region Total		**N/A**	**N/A**	**0**	**N/A**
Calendar Year 2019					
	Southwest Pennsylvania Interstate Air Quality Control Region				
Greene (PA)	$PM_{2.5}$ 24-hr (2006)	7.95	1.40	0.012	2.96
Westmoreland (PA)	Ozone 8-hr (2008) $PM_{2.5}$ 24-hr (2006)	11.2	1.89	0.017	3.30
Air Region Total		**19.2**	**3.28**	**0.029**	**6.26**
	PA General Conformity de minimis	*100*	*50*	*100*	*100*
Marshall (WV)	SO_2 24-hr (2010)	N/A	N/A	0.010	N/A
Air Region Total		**N/A**	**N/A**	**0.010**	**N/A**
	WV General Conformity de minimis	*100*	*100*	*100*	*100*

N/A = Not Applicable

[37] Atlantic and DETI provided estimated general conformity emissions and calculation in their FERC applications on September 18, 2015, and provided updated estimates on November 9, 2016, based on their new proposed construction schedules.

Mandatory Greenhouse Gas Reporting Rule

The EPA established the final Mandatory Greenhouse Gas Reporting Rule, requiring the reporting of operational GHG emissions from applicable sources that emit greater than or equal to 25,000 metric tons of CO_2e in 1 year. Recent additions to the Mandatory Reporting Rule effective for calendar year 2016 require reporting of GHG emissions generated during operation of natural gas pipeline transmission systems, which include blowdown emissions, equipment leaks, and vent emissions at compressor stations, as well as blowdown emissions between compressor stations.

Based on the emission estimates presented, actual GHG emissions from operation of each ACP and SHP compressor station, has the potential to exceed the 25,000 tpy reporting threshold for the Mandatory Reporting Rule. Therefore, Atlantic and DETI would likely be required to report GHG emissions from their respective facilities.

Although this rule does not apply to construction emissions, we have provided GHG construction and operational emission estimates, as CO_2e, for accounting and disclosure purposes in section 4.11.1.3 and tables 4.11.1-5 through 4.11.1-9.

State Regulations

Atlantic and DETI would be required to obtain an air quality permit from the applicable air permitting authority for each of the new and modified compressor stations. The process of obtaining the air permit involves the review and implementation of state regulations. Air quality rules for each state can be found in each state's respective codes as shown below:

- Pennsylvania: Pennsylvania Code (PA Code)
- West Virginia: West Virginia CSR
- Virginia: VAC
- North Carolina: NCAC

State air quality regulations that would establish emission limits or other restrictions in addition to those required under federal regulations are summarized below. Atlantic and DETI would comply with all applicable state air quality rules and regulations.

Pennsylvania

The air quality regulations for the Commonwealth of Pennsylvania are codified in Title 25, subpart C, Article III of the Pennsylvania Code (25 PA Code 121-145). DETI would modify two existing compressor stations in Westmoreland and Greene Counties, Pennsylvania as part of SHP.

These rules outline facility testing and monitoring requirements; prohibit visible off-site fugitive particulate matter emissions; establish requirements and exceptions for open burning; prohibit dispersion techniques designed to circumvent a violation of an air quality standard; and establish SO_2 limits for combustion units, among other things.

- General Provisions (25 PA Code 121): Contains provisions to provide for the control and prevention of air pollution, prohibits the use of stack heights exceeding good engineering practices or dispersion techniques to conceal or dilute emissions to circumvent violation of an air quality regulation.

- Prohibition of Certain Fugitive Emissions (25 PA Code 123.1): Prohibits the emission of fugitive air contaminants from non-exempted sources and requires facilities to minimize airborne particulate emissions.

- Fugitive Particulate Matter (25 PA Code 123.2): Prohibits visible particulate matters emissions outside of the facility's property.

- Particulate Matter Limits for Combustion Units (25 PA Code 123.11): Establishes particulate matter emissions from combustion sources to $3.6E^{-0.56}$ pounds per British thermal unit.

- Sulfur Compound Emissions for Combustion Units (25 PA Code 123.22): Establishes SO_2 limits from combustion units.

- Odor Emissions Limitations (25 PA Code 123.31): Prohibits the emission of malodorous air contaminants from any source if it is detectable outside the property line.

- Visible Emissions Limitations (25 PA Code 123.41): Establishes opacity limits for visible emissions.

- Construction, Modification, Reactivation and Operation of Sources (25 PA Code § 127): Establishes requirements and provisions for obtaining a Plan Approval from the PADEP, and requires the use of best available technology. This rule is applicable to the Crayne and JB Tonkin Compressor Stations.

- Stationary Sources of NO_x and VOCs (25 PA Code 129.91–129.95): Establishes Reasonably Available Control Technology (RACT) requirements for facilities that are major sources for NO_X and/or VOC. DETI will submit a written RACT proposal for each source of VOCs and NO_X at the facility to the PADEP and the EPA.

West Virginia

The air quality regulations for the State of West Virginia are codified in Title 45 of the CSR – Series 1 through 42. Atlantic would construct a new compressor station in Lewis County as part of ACP. In addition, DETI would modify two existing compressor stations in Wetzel and Marshall Counties as part of SHP; however, only activities at the Mockingbird Hill Compressor Station would result in a change in emission emitting equipment. Major rules potentially applicable to these facilities include:

- Control of Air Pollution from Combustion of Refuse (45 CSR 6): Establishes permits and requirements for the open burning of land clearing debris.

- Ambient Air Quality Standards (45 CSR 8): Establishes and adopts ambient air quality standards for criteria air pollutants.

- To Prevent and Control Air Pollution from the Emission of Sulfur Oxides (45 CSR 10): Establishes SO_2 emissions limits and monitoring/recordkeeping requirements.

- Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants (45 CSR 13): Establishes requirements for stationary source permits.

- Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the PSD (45 CSR 14): Establishes major source permit requirements (applicable to the Mockingbird Hill Compressor Station).

- Standards of Performance for New Stationary Sources (45 CSR 16): Establishes standards of performance for new stationary sources promulgated by the EPA.

- To Prevent and Control Particulate Matter Air Pollution from Materials Handling, Preparation, Storage and Other Sources of Fugitive Particulate Matter (45 CSR 17): Establishes provisions to prevent and control particulate matter air pollution from materials handling, preparation, storage, and other sources (which includes roads) of fugitive particulate matter.

- Requirements for Operating Permits (45 CSR 30): Establishes operating permits under Title V of the CAA.

- Emission Standards for HAPs (45 CSR 34): Establishes and adopts national emission standards for HAPs and other regulatory requirements promulgated by the EPA.

<u>Virginia</u>

The air quality regulations for the Commonwealth of Virginia are codified in Title 9 of the VAC, Agency 5, State Air Pollution Control Board. Atlantic would construct a new compressor station in Buckingham County as part of ACP.

- General Provisions (9 VAC 5-20): Establishes provisions to secure and maintain all air quality levels in Virginia.

- Ambient Air Quality Standards (9 VAC 5-30): Establishes State ambient air quality standards and, depending on ambient air quality concentrations, may require air dispersion modeling.

- New and Modified Sources (9 VAC 5-50): Requires the owner/operator of a new or modified emission source to achieve compliance with all standards of performance prescribed under this chapter within 60 days of achieving maximum production rate, but no later than 180 days after initial startup. This rule also establishes recordkeeping and reporting requirements, and requires the use of BACT where applicable.

- Construction Permits (9 VAC 5-80-1100): A6 permitting must be completed before construction of a new source. The required Form 7 application forms and attachments will be included in the Commonwealth permit application to satisfy this requirement for the construction of sources at the facility.

- Emergency Generator General Permit (9 VAC 5-540): Requires installation of non-resettable hour metering devices, which shall be observed by the owner/operator no less than once per month, and recordkeeping requirements.

North Carolina

Atlantic would construct a new compressor station in Northampton County as part of ACP. The following North Carolina Air Quality regulations would apply to the project.

- Construction and Operation Permits (15A NCAC 02Q): Establishes authority to require air quality permits.

- SO_2 Emissions from Combustion Sources (15A NCAC 02D .0516): Establishes limits for SO_2 from combustion sources that discharge into the atmosphere to 2.3 pounds per million Btu input (unless subject to NSPS or maximum achievable control technology [MACT] SO_2 standards).

- Control of visible emissions (15A NCAC 02D .0521): Limits the opacity from newly constructed combustion sources to 20 percent opacity (unless subject to NSPS or MACT opacity standards).

- Excess Emissions Reporting and Malfunctions (15A NCAC 02D .0535): Establishes state-specific requirements for a malfunction and reporting requirements.

- Particulates from Fugitive Dust Emissions Sources (15A NCAC 02D.0540): Requires operators to obtain a permit or subjects facilities to certain requirements which state that the facility shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints.

- Monitoring, Recordkeeping, and Reporting (15A NCAC 02D.0600): Establishes general requirements for monitoring, recordkeeping, and reporting.

- VOCs (15A NCAC 02D.0958): Establishes requirements for VOC emitting sources.

4.11.1.3 Air Emission Impacts and Mitigation

Construction Emissions

Air emissions would be generated during construction of the new mainline and lateral pipelines, modifications at four existing compressor stations, construction of three new compressor stations, and construction of ten new M&R stations.

Construction of ACP and SHP would result in temporary increases of pollutant emissions from the use of diesel- and gas-fueled equipment, blowdown and purging activities, open burning, as well as temporary increases in fugitive dust emissions from earth/roadway surface disturbance. Indirect emissions would be generated from vehicles associated with construction workers traveling to and from work sites. Fugitive dust would result from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. Emissions would be greater during dry periods and in areas of fine-textured soils subject to surface activity. The volume of fugitive dust generated would be dependent upon the area disturbed and the type of construction activity, along with the soil's silt and moisture content, wind speed, precipitation, roadway characteristics, and the nature of vehicular/equipment traffic. We received comments stating that fugitive dust should be controlled during construction of ACP and SHP. Atlantic and DETI would implement measures from their *Fugitive Dust Control and Mitigation Plan* to limit fugitive dust emissions. Measures in this plan include, but are not limited to: application of water or other dust suppressant on unpaved roads, soil stockpiles, and workspaces; enforcing a 15 mile per hour speed limit on the right-of-way and access roads; and restoration of disturbed areas as soon as practicable. We reviewed the *Fugitive Dust Control and Mitigation Plan* and find it acceptable.

Fugitive particulate emissions of PM_{10} and $PM_{2.5}$ were calculated using the EPA AP-42 recommended emission factors for heavy construction equipment, combined with estimates of the extent and duration of active surface disturbance during construction. These emission factors tend to be conservative and can overestimate potential fugitive dust generated by the projects. Combustion emissions from on-road vehicles (e.g., delivery and material removal vehicles) were estimated using the EPA Motor Vehicle Emission Simulator model, which estimates emissions for on-road and non-road vehicles and equipment. Combustion emissions from non-road construction equipment operation were estimated using emission factors generated by EPA Motor Vehicle Emission Simulator based on the anticipated types of non-road equipment and their associated levels of use.

Atlantic and/or DETI contractors may use open burning to dispose of construction debris as described in the *Timber Removal Plan*, *Fire Plan*, and *Open Burning Plan*, except on NFS land where burning is prohibited. No open burning is proposed along TL-636, AP-2, AP-3, AP-4, or AP-5. Open burning would potentially occur along sections of the AP-1 mainline and TL-635 pipeline loop. Atlantic and DETI anticipate that no more than 8 to 12 percent of cleared timber would be burned.

Table 4.11.1-5 provides estimated construction emissions for ACP and SHP. [38]

TABLE.4.11.1-5

Estimated Construction Emissions for the Atlantic Coast Pipeline and Supply Header Project

Source	NO_X	CO	VOC	SO_2	PM	PM_{10}	$PM_{2.5}$	CO_2
	(total tons during construction activities)							
Emissions from Construction Equipment and Open Burning								
ACP Compressor Stations	91.4	58.2	14.1	0.113	9.34	9.34	9.06	19,591
SHP Compressor Stations	73.3	48.7	11.5	0.091	7.71	7.71	7.48	15,748
M&R Stations	28.6	15.6	4.03	0.040	2.57	2.57	2.49	6,970
Pipeline Spread	4,266	4,257	868	5.08	633	627	613	928,262
Estimated Tailpipe Emissions from Vehicles Used by Commuting Construction Workers								
ACP Compressor Stations	3.91	55.0	2.97	0.054	0.231	0.231	0.131	6,602
SHP Compressor Stations	1.62	23.3	1.19	0.022	0.097	0.097	0.055	2,504
M&R Stations	3.38	33.1	1.12	0.035	0.213	0.213	0.156	5,918
Pipeline Spread	44.8	620	45.4	0.735	2.41	2.41	1.20	122,885
Estimated Fugitive Emissions of Particulate Matter from Material Transfers and Road Traffic								
ACP Compressor Stations	-	-	-	-	583	198	34.9	-
SHP Compressor Stations	-	-	-	-	247	86.6	14.7	-
M&R Stations	-	-	-	-	424	138	25.2	-
Pipeline Spread	-	-	-	-	16,943	6,994		-
Total Emissions	**4,513**	**5,111**	**948.3**	**6.17**	**18,853**	**8,066**	**1,817**	**1,108,480**

Construction of ACP and SHP would take place over 2 years. Construction at aboveground facilities and the use of construction support areas would occur over several months at specific locations. Most construction related emissions would be temporary and localized, and would dissipate with time and distance from areas of active construction. Further, construction emissions along the pipelines would subside once construction is complete. Following construction at the compressor stations, emissions would

[38] Detailed emission calculations were provided in Atlantic's and DETI's applications each filed on September 18, 2015, and Atlantic's supplemental filing dated July 1, 2016 (Accession No. 20160701-5255). These detailed emissions calculations can be found on the FERC eLibrary website.

transition to operating emissions. Based on the mitigation measures outlined in Atlantic's and DETI's *Fugitive Dust Control and Mitigation Plan* and the temporary nature of construction, we conclude that construction of ACP and SHP would not have a significant impact on air quality. However, to further minimize construction emissions, Atlantic and DETI could implement measures such as enforcing idling time limits, utilizing clean diesel through add-on technologies, and using newer equipment.

Atlantic and DETI provided estimated construction emissions associated with Atlantic's office building (located at Compressor Station 3) and headquarters office in Northampton, North Carolina and DETI's Hastings Compressor Station. Table 4.11.1-6 provides the construction emissions for the project-related non-jurisdictional facilities.

TABLE 4.11.1-6

Construction Emissions for Non-Jurisdictional Facilities

Facility	NO_X	CO	SO_2	PM_{10}/ $PM_{2.5}$	CO_2e
	(tons per year)				
Atlantic's Office Building and Headquarters	31.24	19.61	0.04	6.23	6,697.4
DETI's Hastings Compressor Station	0.62	0.28	N/A	0.1	197.06

Operation Emissions

Operation of the new and modified ACP and SHP compressor stations and M&R stations would result in air emission increases over existing emissions levels. The turbines at ACP and SHP compressor stations would incorporate SoLoNO_X (i.e., dry low NO_X or lean pre-mix) combustors to control NO_X emissions. In addition, NO_x emissions from the ACP combustion turbines would be further controlled by selective catalytic reduction technology. Typical air emissions sources and activities include the following:

- combustion turbine;
- emergency generator;
- boiler;
- accumulator tank;
- hydrocarbon waste tank;
- aqueous ammonia storage tank; and
- fugitive natural gas emissions.

Air pollutant emissions from operation of ACP proposed compressor stations were calculated using emissions factors from vendor data and the EPA's *Compilation of Air Pollutant Emission Factors* (*AP-42*). CO_2e emissions were calculated based upon Table A-1 of 40 CFR 98, subpart A. The potential-to-emit emissions resulting from the ACP compressor station and M&R stations and SHP compressor stations are summarized in tables 4.11.1-7, 4.11.1-8, and 4.11.1-9, respectively. The Natural Resources Defense Fund expressed concern with emissions from fugitive pipeline leaks and natural gas venting. Blowdown emissions and fugitive CH_4 emissions from natural gas piping leaks were estimated for each of the compressor and M&R stations and have been included in the total emissions listed below. Natural gas fugitive releases from pneumatic valves would be 13.5 tpy of CH_4; 13.5 tpy of CH_4 from valve sites (50 sites for ACP and SHP combined); and 52.0 tpy of CH_4 from pig launchers/receivers (11 sets for ACP and SHP combined). Natural gas fugitive leaks from valve sites, pigging operations, and pneumatic valves for ACP and SHP combined would be 1.86 tpy of VOC and 1,657 tpy of CO_2e.

TABLE 4.11.1-7

Potential Emissions by Compressor Station for the Atlantic Coast Pipeline

Compressor Station	NO_X	CO	VOC	SO_2	$PM/PM_{10}/PM_{2.5}$	CO_2e	HAPs
	(tons per year)						
Compressor Station 1[a] (Lewis County, West Virginia)	42.5	70.7	30.3	7.08	12.2	277,088	5.22
Compressor Station 2[b] (Buckingham County, Virginia)	50.2	95.2	32.7	7.33	43.9	323,736	5.63
Compressor Station 3 (Northampton County, North Carolina)	19.7	31.1	21.8	3.10	18.4	129,243	3.42

a ACP Kincheloe and SHP CNX M&R stations emissions are included in the emissions for Compressor Station 1, as the facilities would be collocated.

b The Woods Run M&R station emissions are included in the emissions for Compressor Station 2, as the facilities would be collocated.

TABLE 4.11.1-8

Potential Emissions by M&R Station for the Atlantic Coast Pipeline

M&R Station	NO_X	CO	VOC	SO_2	$PM/PM_{10}/PM_{2.5}$	CO_2e
	(tons per year)					
Brunswick M&R Station (Brunswick County, Virginia)	2.31	7.78	1.40	0.124	1.47	25,084
Greensville M&R Station (Greensville County, Virginia)	2.46	8.27	1.48	0.131	1.57	226,639
Long Run M&R Station (Randolph County, West Virginia)	17.47	16.33	1.95	0.100	1.29	20,978
Elizabeth River M&R Station (City of Chesapeake, Virginia)	0.039	0.304	0.159	0.000014	0.001	168
Fayetteville M&R Station Johnston County, North Carolina)	0.039	0.304	0.147	0.000014	0.001	157
Pembroke M&R Station (Robeson County, North Carolina)	0.039	0.304	0.227	0.000014	0.001	248
Smithfield M&R Station (Johnston County, North Carolina)	0.039	0.304	0.238	0.000014	0.001	259

TABLE 4.11.1-9

Proposed Emissions by Compressor Station for the Supply Header Project

Compressor Station	NO_X	CO	VOC	SO_2	$PM/PM_{10}/PM_{2.5}$	CO_2e
	(tons per year)					
JB Tonkin (Westmoreland County, Pennsylvania)	28.6	30.5	9.91	2.59	15.4	101,300
Crayne (Greene County, Pennsylvania)	11.3	9.35	8.05	1.08	6.36	44,297
Mockingbird Hill (Wetzel County, West Virginia)	55.5	58.6	17.3	5.17	30.6	197,797
Burch Ridge (Marshall County, West Virginia)	0	0	0.027	0	0	40.9

Air Quality Modeling

Atlantic and DETI performed air quality modeling analyses for each of the new and modified compressor stations. Background pollutant concentrations were estimated using existing ambient monitoring data for the region. The background monitors were determined based on proximity and general representativeness of the monitoring sites to each of the ACP and SHP compressor stations. The background concentrations were combined with the model results and compared to the NAAQS. Atlantic and DETI modeled air quality impacts from their respective compressor stations using the EPA approved AERMOD Model (version 1518). We reviewed the modeling analyses and agree with these conclusions.

Atlantic Coast Pipeline

Atlantic used a screening meteorological dataset, MAKEMET version 15181, to create a site-specific set of worst-case meteorological conditions to be used as input for AERMOD, which was run in screening mode. The screening mode of AERMOD provides estimates for the worst case 1-hour concentrations of multiple sources using fully developed terrain and receptor data. Data were obtained from representative air quality monitoring stations to characterize the background air quality for each compressor station and are presented in table 4.11.1-10.

TABLE 4.11.1-10

Summary of Background Concentrations and Air Quality Monitoring Stations for the Atlantic Coast Pipeline

Facility	Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$) [a]	Station ID	Station Location
Compressor Station 1	NO_2	1-hour	67.68	421250005	Charleroi, PA
		Annual	16.92		
	CO	1-hour	1,145	540090011	Weirton-Steubenville, WV-OH
		8-hour	916		
	$PM_{2.5}$	24-hour	19	540330003	Clarksburg, WV
		Annual	9.1		
	PM_{10}	24-hour	33	540390010	Charleston, WV
Compressor Station 2	NO_2 [b]	1-hour	69.56	511611004	Roanoke, VA
		Annual	16.92	511650003	Harrisonburg, VA
	CO	1-hour	1,374	511611004	Roanoke, VA
		8-hour	1,259.5		
	$PM_{2.5}$	24-hour	17	510030001	Charlottesville, VA
		Annual	7.6		
	PM_{10}	24-hour	34	510870014	Richmond, VA
Compressor Station 3	NO_2	1-hour	80.84	510360002	Richmond, VA Charles County
		Annual	9.4		
	CO	1-hour	1,717.5	371830014	Raleigh-Durham, NC
		8-hour	1,374		
	$PM_{2.5}$	24-hour	18	510360002	Richmond, VA Charles County
		Annual	7.9		
	PM_{10}	24-hour	33	516700010	Hopewell, VA

[a] Background concentrations are the 2014 design values for all pollutants except for PM_{10}, which is the maximum value over the 2012-2014 period.

[b] Compressor Station 2: Annual NO_2 background value is represented using the Harrisonburg, VA monitor, which is the closest NO_2 monitor to the site. However, 1-hour NO_2 values are not available for this site, and so the next closest station in Roanoke, VA is used for the 1-hour value.

$\mu g/m^3$ = $\mu g/m^{3}$ = microgram per cubic meter

All equipment at the compressor stations would be permitted to operate for up to 8,760 hours per year except for the emergency generators, which would be operated not more than 100 hours a year for non-emergency use (e.g., testing and maintenance). The emergency generators have no hourly limit on emergency operations. Atlantic modeled the reduction of operational hours for the emergency generators by using an annualized emission rate instead of a short-term emission rate for NO_X and $PM_{2.5}$/PM_{10} modeling. CO was modeled using short-term emission rates for all sources.

Table 4.11.1-11 provides the results of the modeling analyses for the compressor stations associated with ACP, including the compressor station impact, the combined ambient and station concentrations, and a comparison with the NAAQS.

TABLE 4.11.1-11

Air Quality Model Results for the Atlantic Coast Pipeline

Facility	Pollutant	Averaging Period	Background Concentration (μg/m^3)	Model Result (μg/m^3)	NAAQS (μg/m^3)	Background + Model Concentration (μg/m^3)
Compressor Station 1	NO_2	1-hour	67.7	19.7	188	87.4
		Annual	16.9	1.8	100	18.8
	CO	1-hour	1,145	3,708	40,000	4,853
		8-hour	916	3,337	10,305	4,253
	$PM_{2.5}$	24-hour	19	15.0	35	34.0
		Annual	9.1	2.49	12	11.59
	PM_{10}	24-hour	33	15.0	150	48.0
Compressor Station 2	NO_2	1-hour	69.6	83.3	188	152.9
		Annual	16.9	7.8	100	24.7
	CO	1-hour	1374	196.0	40,000	1,570.0
		8-hour	1,259.5	176.4	10,305	1,435.9
	$PM_{2.5}$	24-hour	17	11.7	35	28.7
		Annual	7.6	1.9	12	9.5
	PM_{10}	24-hour	34	11.7	150	45.7
Compressor Station 3	NO_2	1-hour	80.8	37.9	188	118.8
		Annual	9.4	3.6	100	13.0
	CO	1-hour	1,717.5	3,951	40,000	5,668
		8-hour	1,374	3,556	10,305	4,930
	$PM_{2.5}$	24-hour	18	6.0	35	24.0
		Annual	7.9	1.0	12	8.9
	PM_{10}	24-hour	33	6.0	150	39.0

μg/m^3 = microgram per cubic meter

As demonstrated in table 4.11.1-11 above, ACP compressor stations would not cause or contribute to a violation of the NAAQS.

Supply Header Project

The air quality modeling analyses for SHP were conducted using the most recent version of the EPA regulatory air dispersion model, AERMOD version 15181. All the existing and newly proposed equipment were included in the modeling analyses to determine each facility's cumulative impact to the surrounding air quality.

Background values for 1-hour NO_2 were determined using the third highest average background value over a 3-year period, between 2010-2013, averaged by season and hour of day. This method is in accordance with EPA guidance. All other pollutants and averaging periods used the 2014 design value for the background concentrations, except for PM_{10}, which used the maximum value over the 2012-2014 period.

Data were obtained from representative air quality monitoring stations to characterize the background air quality for each compressor station and are presented in table 4.11.1-12.

TABLE 4.11.1-12

Summary of Background Concentrations and Air Quality Monitoring Stations for the Supply Header Project

Facility	Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$) [a]	Station ID	Station Location
JB Tonkin Compressor Station	NO_2 [b]	1-hour	Hourly/Seasonal	420031005	Natrona Heights, PA
		Annual	16.92	421250005	Charleroi, PA
	CO	1-hour	3,091.5	420030008	Lawrenceville, PA
		8-hour	1,603		
	$PM_{2.5}$	24-hour	22	420031008	Natrona Heights, PA
		Annual	10		
	PM_{10}	24-hour	43	420030003	Monroeville, PA
Crayne Compressor Station	NO_2	1-hour	Hourly/Seasonal	421250005	Charleroi, PA
		Annual	16.92		
	CO	1-hour	2,862.5	421250005	Charleroi, PA
		8-hour	916		
	$PM_{2.5}$	24-hour	21	421250200	Washington, PA
		Annual	10		
	PM_{10}	24-hour	54	421250005	Charleroi, PA
Mockingbird Hill Compressor Station	NO_2	1-hour	Hourly/Seasonal	421250005	Charleroi, PA
		Annual	16.92		
	CO	1-hour	2,862.5	421250005	Charleroi, PA
		8-hour	916		
	$PM_{2.5}$	24-hour	19	540490006	Fairmont, WV
		Annual	9.7		
	PM_{10}	24-hour	54	421250005	Charleroi, PA

[a] Background concentrations are the 2014 design values for all pollutants except for PM_{10}, which is the maximum value over the 2012-2014 period, and 1-hour NO_2. 1-hour NO_2, values were determined using the 3rd highest average background value over the 2010-2013 period, averaged by season and hour of day.

[b] JB Tonkin Compressor Station: 1-hour NO_2 background values are variable and are represented using the Natrona Heights, PA monitor, which is the closest NO_2 monitor to the site. However, a 2014 annual NO_2 design value is not available for this site, and so the next closest station with a 2014 annual design value is in Charleroi, PA.

All equipment at the compressor stations would be permitted to operate for up to 8,760 hours per year except for the emergency generators. The existing emergency generators are currently permitted to operate not more than 500 hours a year, while new emergency generators would operate not more than 100 hours a year for non-emergency use (e.g., testing and maintenance). The emergency generators have no hourly limit on emergency operations. DETI modeled the reduction of operational hours for the emergency generators by using an annualized emission rate instead of a short-term emission rate for NO_X and $PM_{2.5}/PM_{10}$ modeling. CO was modeled using short-term emission rates for all sources.

Table 4.11.1-13 below provides the results of the modeling analyses for the compressor stations associated with SHP, including the compressor station impact, the combined ambient and station concentrations, and a comparison with the NAAQS.

TABLE 4.11.1-13

Air Quality Model Results for the Supply Header Project

Facility	Pollutant	Averaging Period	Background Concentration (µg/m³) [a]	Model Result (µg/m³)	NAAQS (µg/m³)	Background + Model Concentration (µg/m³)
JB Tonkin Compressor Station	NO_2 [b]	1-hour	Hourly/Seasonal	116.7	188	163.7
		Annual	16.92	6.8	100	23.7
	CO	1-hour	3091.5	3,228	40,000	6,319
		8-hour	1603	1842	10,305	3,445
	$PM_{2.5}$	24-hour	22	2.2	35	24.2
		Annual	10	0.5	12	10.5
	PM_{10}	24-hour	43	2.9	150	45.9
Crayne Compressor Station	NO_2	1-hour	Hourly/Seasonal	45.5	188	90.0
		Annual	16.92	2.3	100	19.2
	CO	1-hour	2862.5	106.4	40000	2,969
		8-hour	916	50.1	10305	966
	$PM_{2.5}$	24-hour	21	1.5	35	22.5
		Annual	10	0.3	12	10.3
	PM_{10}	24-hour	54	2.7	150	56.7
Mockingbird Hill Compressor Station	NO_2	1-hour	Hourly/Seasonal	117.1	188	164.2
		Annual	16.92	13.3	100	30.2
	CO	1-hour	2862.5	7,536	40,000	10,398
		8-hour	916	4,623	10,305	5,539
	$PM_{2.5}$	24-hour	19	5.1	35	24.1
		Annual	9.7	1.2	12	10.9
	PM_{10}	24-hour	54	7.6	150	61.6

[a] Background concentrations are the 2014 design values for all pollutants except for PM_{10}, which is the maximum value over the 2012-2014 period, and 1-hour NO_2. 1-hour NO_2, values were determined using the 3rd highest average background value over the 2010-2013 period, averaged by season and hour of day.

[b] JB Tonkin Compressor Station: 1-hour NO_2 background values are variable and are represented using the Natrona Heights, PA monitor, which is the closest NO_2 monitor to the site. However, a 2014 annual NO_2 design value is not available for this site, and so the next closest station with a 2014 annual design value is in Charleroi, PA.

As demonstrated in table 4.11.1-13 above, SHP compressor stations would not cause or contribute to a violation of the NAAQS.

We received a request to consider conducting a health impact assessment. Air quality is discussed throughout section 4.11, and the modeling analyses for the compressor stations associated with ACP and SHP demonstrated that the impacts from the new compressor facilities, when combined with the existing background levels, would remain in compliance with the NAAQS, which were established by the EPA to be protective of human health, including children, the elderly, and sensitive populations. The NAAQS criteria pollutants are implemented and enforced by the states in which the project facilities would be constructed and operated. The EPA has also established standards for HAP emissions for specific source categories under the CAA. The projects' facilities would be designed, constructed, and operated in compliance with these applicable standards and regulations. Therefore, we conclude that a health impact assessment is not required.

We received comments indicating that harmful, toxic chemicals would be released into the atmosphere during blowdown events. Blowdown events could occur at valve sites and pig launcher/receiver sites during operation of ACP and SHP pipelines. Blowdown events would also occur at compressor stations. Blowdowns at valve sites would be infrequent and would last approximately 5 to 20 minutes. Natural gas (methane/CH_4) is released during blowdown events. Methane, a GHG, is lighter than air and rises into the atmosphere. Methane is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. However, when released into the atmosphere (as opposed to a confined space), sufficient air mixing would occur to negate this hazard. Noise impacts associated with blowdown events are discussed in section 4.11.2.2.

4.11.1.4 Radon Exposure

We received comments about the potential exposure to released radon gas. We have recently evaluated general background information, studies, and literature on radon in natural gas in several past project EISs.[39] These studies include samples taken at well sites, pre-processing, post processing, and transmission pipelines and the recent PADEP's Technologically Enhanced Naturally Occurring Radioactive Materials Study Report issued in January 2015 (PADEP, 2016b). This PADEP report is consistent with past studies, which identify indoor radon concentrations ranging from 0.0042 picocuries per liter to 0.13 picocuries per liter.

The EPA has set the indoor action level for radon at 4 picocuries per liter. If concentrations of radon are high enough to exceed these activity levels, the EPA recommends implementing remedial actions, such as improved ventilation, to reduce levels below this threshold. Further, the Indoor Radon Abatement Act established the long-term goal that indoor air radon levels be equal to or better than outdoor air radon levels. The average home in the United States has a radon activity level of 1.3 picocuries per liter, while outdoor levels average approximately 0.4 picocuries per liter. Past studies demonstrate that indoor radon concentrations from Marcellus Shale sourced gas would remain below the EPA action level and the Indoor Radon Abatement Act long-term goal. Therefore, we find that the risk of exposure to radon in natural gas is not significant.

Based on the estimated emissions from construction and operation of ACP and SHP facilities, Atlantic's and DETI's commitments to comply with the required federal and state regulations, and our review of the modeling analysis, we agree that the projects would result in continued compliance with the NAAQS, and conclude that ACP and SHP would not result in significant impact on local or regional air quality.

4.11.2 Noise

Construction and operation of ACP and SHP would affect overall noise levels in the project area. The ambient sound level of a region is defined by the total noise generated within the specific environment and is comprised of natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetation cover.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the L_{dn}. The

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39 New Jersey-New York Expansion Project Final EIS (Docket No. CP11-56) issued March 2012; Rockaway Delivery Lateral and Northeast Connector Projects Final EIS (Docket Nos. CP13-36 and CP13-132) issued February 2014; and the Algonquin Incremental Market Project Final EIS (Docket No. CP14-96) issued January 2015.

L_{eq} is a sound level over a specific period corresponding to the same sound energy as measured for an instantaneous sound level assuming it is a constant noise source. Sound levels are perceived differently, depending on the length of exposure and time of day. The L_{dn} considers the time of day and duration the noise is encountered. Specifically, in calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dBA to account for people's greater sensitivity to sound during nighttime hours. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn}, for a facility to meet the 55 dBA L_{dn} limit, the facility must be designed such that the constant 24-hour noise level does not exceed an L_{eq} of 48.6 dBA at any NSA. The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Table 4.11.2-1 demonstrates the relative dBA noise levels of common sounds measured in the environment and industry. As a point of reference, a person's threshold of perception for a noticeable change in loudness is about 3 dBA, whereas a 5 dBA change is clearly noticeable, and a 10 dBA change is perceived as twice as loud.

TABLE 4.11.2-1

Sound Levels (dBA) and Relative Loudness

Description of Sound	Sound Level (dBA)
Threshold of pain	140
Jet taking off (200-foot distance)	130
Operating heavy equipment	120
Night club with music	110
Construction site	100
Boiler room	90
Freight train (100-foot distance)	80
Classroom chatter	70
Conversation (3-foot distance)	60
Urban residence	50
Soft whisper (5-foot distance)	40
North rim of Grand Canyon	30
Silent study room	20
Threshold of hearing (1,000 hertz)	0

Adapted from OSHA, 1999.

4.11.2.1 Noise Regulatory Requirements

Federal Regulations

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. We have adopted this criterion and used it to evaluate to potential noise impacts from the proposed projects at pre-existing NSAs such as schools, hospitals, and residences. In addition, Commission regulations state that operation of compressor stations may not result in any perceptible increase in vibration at any NSA.

State Regulations

There are no known state noise regulations applicable to ACP and SHP.

Local Regulations

Numerical local noise regulations are in place in Nelson County, Virginia, and Halifax and Cumberland Counties, North Carolina. There are no other known local noise regulations applicable to ACP and SHP.

<u>Virginia</u>

Some of the counties and cities in Virginia have ordinances that prohibit plainly audible noise from radios, televisions, loudspeakers, musical instruments, phonographs, or similar devices during nighttime periods at 50 feet from the building, structure, or vehicle in which the sound source is located (e.g., Buckingham County Noise Control Ordinance, Rev 10-9/12; Greenville County Noise Ordinance, Sec. 15-52 Ord. No. 90-02, 12-3-90; Amd. of 1-18-00; and City of Chesapeake noise ordinance, Sec. 26-124, Ord. No. 09-O-129, 11-24-09).

Aside from sound devices and amplification machines, the City of Chesapeake noise ordinance (Sec. 26-124[3]) also prohibits "construction, erection, demolition, alteration, repair, excavation or demolition work on public or private property, or in any building, structure, street, road, highway or alley" if conducted between the hours of 10:00 p.m. and 6:30 a.m. and if these activities generate plainly audible sound at 50 feet or more from the source of the noise.

In Nelson County, maximum permissible sound levels in residential areas are 65 decibels (dB) during the daytime (7:00 a.m. to 10:00 p.m.) and 55 dB at nighttime (10:00 p.m. to7:00 a.m.).

<u>North Carolina</u>

In Halifax County, sound levels of 55 dB during the daytime (7:00 a.m. to 11:00 p.m.) and 50 dB at nighttime (11:00 p.m. to 7:00 a.m.) are not permissible in residential areas.

In Cumberland County, there is a maximum permissible sound level of 60 dB during the daytime (6:00 a.m. to 10:00 p.m.) and 55 dB at nighttime (10:00 p.m. to 6:00 a.m.) for more than 5 minutes in residential areas or 10 percent of the sound level measurements, at 5-second intervals during a measurement period of at least 10 minutes, taken at or beyond the property boundary of the land use from which the sound emanates. Any source of sound that is the subject of a specific exemption or special permit shall not be permitted to exceed ambient sound levels by more than 15 dB.

4.11.2.2 Noise Level Impacts and Mitigation

Construction Noise Impacts and Mitigation

Noise would be generated during construction of the pipeline and the aboveground facilities for ACP and SHP. Noise levels would be highest in the immediate vicinity of construction activities and would diminish with distance from the work area. These impacts would be localized and temporary. The changing number and type of construction equipment at these sites would result in varying levels of noise. Construction activities associated with the projects would be performed with standard heavy equipment such as track-excavators, backhoes, cranes, bulldozers, dump trucks, boring equipment, and cement trucks. In addition, various powered pumps would be used to control water in the workspace or during hydrostatic testing activities. Noise would also be generated by trucks and other light vehicles traveling in and near areas under construction.

Pipeline construction would occur for approximately 10 hours per day (between the hours of 6:00 a.m. and 6:00 p.m.), 6 days per week, while aboveground facility construction would take place between the hours of 6:00 a.m. to 10:00 p.m. If necessary, 24-hour construction activities could occur at aboveground facilities, but would be limited to work inside station buildings (e.g., electrical work). HDD activities at all locations would occur on a 24-hour basis.

Surface topography, vegetation cover, wind, and weather conditions would also affect the distance that construction-related noise would extend from the workspace. Tall, dense vegetation and rolling topography typically attenuates noise when compared to less vegetated, open land. Typically, the most prevalent sound source during construction would be the internal combustion engines used to power the construction equipment. Table 4.11.2-1, above, provides relative loudness levels. Table 4.11.2-2, below, provides estimated noise levels (50 feet from the source) for typical construction equipment.

TABLE 4.11.2-2

Noise Levels of Major Construction Equipment [a]

Equipment Type	Sound Level at 50 Feet (dBA)
Trucks	85
Crane	85
Roller	85
Bulldozers	85
Pickup Trucks	55
Backhoes	80
Grader	85
Portable generators	84
Jackhammer	89
Pumps	81
Horizontal Boring Hydraulic Jack	82

[a] FHA, 2006.

Pipeline Construction

Construction equipment noise levels would typically be about 85 dBA at 50 feet when equipment is operating at full load, which could be heard by people in nearby buildings. However, most pipeline construction noise would be localized. Atlantic and DETI would construct their respective pipelines during daytime hours. Some discrete activities (e.g., hydrostatic testing, tie-ins, and purge and packing the pipeline) may require 24 hours of activity for limited periods of time, as would some HDD operations (see below). However, these activities would be short-term. Due to the temporary, transitory, and localized nature of pipeline construction, we conclude that pipeline construction noise would not have a significant impact on nearby landowners.

Sound generated by construction of the projects during daytime hours is exempt from compliance with the local ordinances in the project areas. To comply with other local noise ordinances, Atlantic would instruct the contractors to operate radios used during construction of ACP (e.g., radios in contractor vehicles) at low volumes in residential areas so that the radios would not be plainly audible at 50 feet from the source of the noise. With respect to the City of Chesapeake noise ordinance, if nighttime construction activity is required, Atlantic would apply to the City Manager in the City of Chesapeake for a special permit in accordance with section 26-142 of the City of Chesapeake noise ordinance.

Commenters expressed concern with construction noise impacts on construction workers and wildlife. Atlantic, DETI, and their contractors would adhere to the OSHA's laws and regulations to ensure a safe working environment. Construction-related safety and health regulations can be found at 29 CFR

1926. Section 1926.52, Occupational Noise Exposure, specifically addresses construction-related noise. During construction, mobile wildlife species would likely relocate away from the construction area to avoid the noise. Immobile species would be impacted; however, noise at any given location would be localized and temporary. Once construction is complete, noise levels would return to preconstruction levels. Additional noise impacts on wildlife are discussed in section 4.5.8.

HDD Operations

The ACP pipeline route includes 20 locations where Atlantic proposes to use the HDD construction method. HDD operations would generate noise at drill entry and exit points. HDD activities in any one area could last from several weeks to several months depending on the length of the drill and the hardness of the substrate being drilled. Atlantic estimates that the HDDs would take about 3 to 6 weeks at each location, except for the James River/Mayo Creek HDD (3 to 4 months) and the BRP/ANST HDD (12 to 14 months).

Typical equipment used at HDD entry sites includes:

- drilling rig and engine-driven hydraulic power unit;
- two triplex centrifugal main mud pumps and two engine-driven generator sets;
- mud mixing/cleaning equipment with five ditch pumps and three mud tank pumps;
- fluid system shale shaker;
- mobile equipment including a crane, backhoe, front loader, and boom truck; and
- five engine-driven light plants.

Noise associated with HDD exit sites could result from use of the following equipment:

- one triplex centrifugal main mud pump;
- mud tank with three pumps;
- backhoe and/or truck(s);
- welding;
- one electric-driven generator set; and
- five engine-driven light plants.

The results of Atlantic's HDD noise assessment are summarized in table 4.11.2-3. Additional NSAs are also present, in most cases farther from the noise-generating sources at the HDD entry/exit sites. In some instances, noise may be greater at NSAs slightly farther than the closest NSA due to topography, local vegetation patterns, proximity to both the entry and exit sites, and ACP's mitigation measures. The locations (NSAs) with the greatest estimated noise increase are presented below. There are no NSAs within 0.5 mile of the Roanoke River crossing and the exit sites for the South Branch Elizabeth River and Fishing Creek crossings. At the Roanoke River crossing, the nearest NSA to the entry point is 6,000 feet northwest, and the nearest NSA to the exit point is 6,100 feet west. To ensure that no NSAs would be impacted by the two new proposed HDDs, **we recommend that:**

- **<u>As part of its Implementation Plan</u>, Atlantic should file with the Secretary aerial photographs depicting the entry and exit sites for the proposed Interstate 79 and Route 58 HDDs. The aerials should identify any NSAs within 0.5 mile of the entry/exit sites for each HDD or clearly demonstrate that there are no NSAs within 0.5 mile of the entry/exit sites.**

TABLE 4.11.2-3

Estimated Noise Levels for Horizontal Directional Drill Entry and Exit Sites

HDD Entry and Exit Site	Nearest NSA[a]	Distance and Direction of NSA from Drill Site (feet)	Existing Ambient Sound Level (L_{dn}) dBA	Estimated Sound Level (L_{dn}) of the HDD[c] dBA	Estimated Total Sound Level (HDD L_{dn} + Ambient L_{dn}) dBA	Potential Increase above Ambient[c] dB
BRP/ANST Entry	S2	1,300 (NW)	57.4	40.5	57.5	0.1
BRP/ANST Entry[d]	S9	600 (WNW)	59.3	45.5[b]	59.5	0.2
James River/Mayo Creek Entry	S1	2,100 (WNW)	58.1	33.1	58.1	0.0
James River/Mayo Creek Exit	S2	1,000 (NNE)	57.0	28.0	57.0	0.0
Nottoway River Entry	S1	2,000 (SE)	45.6	33.6	45.9	0.3
Nottoway River Exit	S7	1,250 (ENE)	50.7	41.7	51.2	0.5
Blackwater River Entry	S5	600 (NW)	52.3	46.2[b]	53.3	1.0
Blackwater River Exit	S12	2,100 (SSW)	52.5	39.3	52.7	0.2
Lake Prince Entry	S4	500 (WNW)	47.8	49.8[b]	51.9	4.1
Lake Prince Exit	S11	625 (E)	47.8	51.9	53.4	5.6
Western Branch Reservoir Entry	S3	2,100 (W)	48.7	50.8	52.9	4.2
Western Branch Reservoir Exit	S7	1,100 (S)	56.4	38.1	56.5	0.1
Western Tributary to Nansemond River Entry	S2	2,000 (N)	49.7	38.4	50.0	0.3
Western Tributary to Nansemond River Exit	S3	500 (E)	55.9	51.8	57.3	1.4
Nansemond River Entry	S1	1,300 (NNE)	51.8	47.2	53.1	1.3
Nansemond River Exit	S3	2,500 (E)	54.2	34.0	54.3	0.1
Interstate 64 Entry	S1	225 (ENE)	61.5	52.9[b]	62.1	0.6
Interstate 64 Exit	S8	250 (SSE)	57.9	51.9[b]	58.9	1.0
Route 17 Entry	S5	225 (SSE)	59.9	**62.9**[b]	64.7	4.8
Route 17 Exit	S13	80 (S)	56.0	**59.5**[b]	61.1	5.1
South Branch Elizabeth River Entry	S1	2,300 (SSE)	55.6	52.6	57.4	1.8
South Branch Elizabeth River Exit	N/A	N/A	N/A	N/A	N/A	N/A
Cape Fear Alternate Entry	S2	750 (NW)	48.1	50.8	52.7	4.6
Cape Fear Alternate Exit	S3	2,300 (W)	48.9	44.8	50.3	1.4
Roanoke River Entry	N/A	N/A	N/A	N/A	N/A	N/A
Roanoke River Exit	N/A	N/A	N/A	N/A	N/A	N/A
Fishing Creek Entry	S3	1,600 (SW)	52.7	54.4	56.6	3.9
Fishing Creek Exit	N/A	N/A	N/A	N/A	N/A	N/A
Swift Creek Entry	S11	500 (SE)	46.7	**59.4**[b]	59.7	**13.0**
Swift Creek Entry	S13	650 (W)	46.3	**56.4**[b]	56.8	**10.1**
Swift Creek Exit	S14	500 (NW)	46.3	**59.4**[b]	59.6	**13.3**
Swift Creek Exit	S1	550 (SW)	47.1	47.5[b]	50.3	3.2
Tar River Entry	S2	2,450 (NE)	48.4	49.4	51.9	3.6
Tar Creek Exit	S7	800 (SSE)	47.5	51.5	53.0	5.5
Contentnea Creek Entry	S7	900 (SW)	46.8	53.4	54.3	7.5
Contentnea Creek Exit	S6	2,200 (SW)	46.8	45.4	49.2	2.4
Little River Entry	S4	1,900 (E)	46.3	50.4	51.8	5.6
Little River Exit	S8	1,200 (SE)	46.7	36.5	47.1	0.4

N/A = not applicable; i.e., no NSA within 0.5 mile of the HDD entry or exit site

a All NSAs listed in the table are residences.

b HDD noise estimates include the application of mitigation measures (i.e., a noise control barrier wall).

c Noise increases equal to or greater than 10 dBA above ambient or that would exceed the FERC level of 55 dBA L_{dn} are shown in **bold**.

d The HDD at the BRP would involve an "intercepting drill," which requires drilling on both ends of the HDD segment, resulting in two entry sites.

As indicated (in bold) in table 4.11.2-3, NSAs near the Route 17 and Swift Creek entry and exit sites are estimated to exceed the FERC's 55 dBA L_{dn} noise guideline at the nearest NSA. The HDD noise levels at these locations would range from 4.8 dBA to 13.3 dBA above ambient. In addition, NSAs S11, S13, and S14 near the Swift Creek entry site would experience a 10 dBA or greater increase in noise above ambient. Atlantic would install a noise control wall at these locations (which was taken into account in the noise estimates); however, these locations would still result in noise levels above the FERC guideline of 55 dBA, L_{dn}. Accordingly, Atlantic proposes to temporarily relocate landowners where noise levels exceed the FERC guideline. Atlantic would notify residents 1 month prior to the start of HDD operations, and would finalize temporary relocation plans 2 weeks prior to drilling. Relocation could last for the duration of the drill, approximately 3 to 6 weeks.

In addition, we received comments from the Fenton Inn that noise from HDD activities could impact its business. The Fenton Inn, which is identified as NSA S9 in table 4.11.2-3, is approximately 400 feet from the southeast BRP HDD entry point at the nearest structure based on the site-specific HDD drawing that has been filed by Atlantic. However, we note that Atlantic completed its noise analysis assuming the Fenton Inn was 600 feet from the HDD entry point (thus underestimating the noise impact at the Inn), and we have taken this discrepancy into consideration of our noise analysis. Atlantic proposes to install a noise barrier wall at the entry site near the Fenton Inn, as recommended by Atlantic's noise consultant. As a result, the increase in noise level experienced at the NSA would be below 3 dBA, or the threshold of noticeable difference. We also received comments from the Wintergreen Property Association indicating that its Gatehouse (approximately 600 feet away) and office building (approximately 900 feet away) were omitted as NSAs near the BRP HDD site. To ensure that the actual HDD noise levels are below our noise criterion at the Fenton Inn and the Gatehouse for the Wintergreen Property Owners Association, and that HDD noise levels do not significantly impact the NSAs near the Route 17 and Swift Creek entry and exit sites, **we recommend that**:

- **Atlantic should file in the <u>weekly construction status reports</u> the following for NSA S9, the Gatehouse, and the office building near BRP; the Route 17 HDD entry and exit sites; and NSAs S11, S13, and S14 near the Swift Creek entry site:**

  a. the noise measurements from these NSAs, obtained at the start of drilling operations;

  b. the noise mitigation that Atlantic implemented at the start of drilling operations; and

  c. any additional mitigation measures that Atlantic would implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise is greater than 10 dBA over ambient conditions.

Operational Noise Impacts and Mitigation

Pipeline Facilities

Operation of the ACP and SHP pipelines would not typically cause noise impacts, except during pipeline blowdown events at valve sites and pig launcher/receiver sites. A blowdown involves the venting of natural gas from the pipeline or compressor station components into the atmosphere. Most blowdowns occur because of system testing or maintenance activities. Noise resulting from a planned blowdown event would be localized and short-term, lasting less than 10 minutes. Planned blowdowns as a result of certain operations activities at valve sites would be infrequent and the associated noise level is estimated to be about 56 dBA at 1,000 feet from the valve or meter site. In addition, Atlantic would employ mobile blowdown silencers during each planned blowdown event to reduce noise to meet 85 dBA at 50 feet. Unplanned blowdowns because of emergency events are very infrequent and would be unsilenced to purge the pipeline as quickly as possible; the associated noise level of an emergency blowdown would be about 100 dBA at 1,000 feet from the valve or meter site.

Compressor Stations

The operational noise impact evaluation for ACP and SHP considers the noise produced by all sound-generating sources associated with the proposed and modified compressor stations that could impact the sound contribution at nearby NSAs. Such sound sources include the turbine-driven compressor units, gas cooling equipment, and aboveground gas piping at each station. Our noise evaluations incorporate noise level reductions from the companies' proposed mitigation measures. Noise controls for the compressor buildings include acoustical specifications for wall, roof, and entry door materials; prohibition of windows or skylights; and acoustical specifications for the ventilation system.

Atlantic and DETI would implement noise mitigation measures for the proposed and modified compressor stations. These measures include, but are not limited to:

- exhaust silencers;
- air intake cleaner/silencers and air intake duct acoustic insulation;
- noise attenuating materials for wall, roof, and doors of compressor buildings;
- lubrication oil cooler maximum noise level of 50 dBA at 50 feet;
- ventilation air inlet and discharge mufflers;
- acoustical insulation for aboveground piping; and
- unit blowdown silencers (60 dBA at 50 feet);

Table 4.11.2-4 shows the estimated noise impact at the nearest NSAs due to the full load operation of Atlantic's new compressor stations.

As demonstrated in table 4.11.2-4, the noise associated with ACP compressor stations would be below the FERC guideline. Noise level increases at NSAs near Compressor Station 1 would range from 0.4 dBA to 8.5 dBA; 0.5 dBA to 2.9 dBA at Compressor Station 2; and 2.3 dBA to 8.0 dBA at Compressor Station 3. The estimated noise increase at most NSAs would be below 3 dBA, which is the threshold of perception for the human ear.

To ensure that noise levels due to operation of the proposed compressor stations would not be significant, **we recommend that:**

- **Atlantic should file a noise survey with the Secretary <u>no later than 60 days</u> after placing each of the ACP compressor stations in service. If a full load condition noise survey is not possible, Atlantic should instead file an interim survey at the maximum possible horsepower load and file the full load survey <u>within 6 months</u>. If the noise attributable to the operation of all of the equipment at any station under interim or full horsepower load exceeds 55 dBA, L_{dn} at any nearby NSA, Atlantic should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Atlantic should confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

TABLE 4.11.2-4 **Estimated Noise Levels for the Proposed Atlantic Coast Pipeline Compressor Stations**					
Nearest NSA (Residences)	Distance and Direction from Compressor Station (feet)	Existing Ambient Sound Level (dBA, L_{dn})	Estimated Compressor Station Operational Noise[a] (dBA, L_{dn})	Station Noise + Existing Ambient (dBA, L_{dn})	Noise Increase (dBA)
Compressor Station 1 (Marts)[b]					
S1	3,600 (NNW)	40.5	31.4	41.0	0.5
S2	3,000 (NNW)	44.4	34.4	39.2	1.7
S3	1,800 (N)	39.6	40.4	43.0	3.4
S4	2,000 (NNE)	40.7	38.4	42.7	2.0
S5	2,300 (ENE)	43.2	37.4	44.2	1.0
S6	1,900 (E)	41.1	39.4	43.3	2.2
S7	1,900 (ESE)	50.0	39.4	50.4	0.4
S8	1,000 (SSE)	38.6	46.4	47.1	8.5
S9	2,800 (SSW)	38.7	35.4	40.4	1.7
S10	2,900 (SW)	37.9	35.4	39.9	2.0
Compressor Station 2 (Buckingham)[c]					
S1	2,700 (WNW)	45.9	37.4	46.4	0.5
S2	1,800 (WNW)	46.0	42.4	47.6	1.6
S3	1,450 (WNW)	44.6	44.4	47.5	2.9
S4	1,900 (NNW)	43.2	42.4	45.8	2.6
S5	3,600 (ENE)	41.2	35.4	42.2	1.0
S6	3,000 (ESE)	46.1	38.4	46.8	0.7
S7	3,100 (ESE)	42.7	37.4	43.9	1.2
S8	2,000 (SE)	43.4	42.4	45.9	2.5
S9	2,100 (SE)	43.4	41.4	45.5	2.1
Compressor Station 3 (Northampton)					
S1	850 (NNW)	38.2	45.4	46.2	8.0
S2	1,700 (NE)	38.9	37.4	41.2	2.3

a Estimated compressor station operational noise includes mitigation.
b Noise estimates include measuring station.
c Noise estimates include M&R Station.

Table 4.11.2-5 shows the estimated noise impact at the nearest NSAs due to the full load operation of DETI's modified JB Tonkin Compressor Station.

The noise attributable solely to the proposed modifications at the JB Tonkin Compressor Station would be below the FERC guideline at each NSA. In addition, any noise increase would be below 3 dBA at each NSA. NSAs S10, S11, S12, and S14 would experience total noise levels above the FERC guideline after the proposed modifications; however, these NSAs would experience an overall *decrease* in noise ranging from 1.1 dBA to 3.9 dBA.

TABLE 4.11.2-5

Estimated Noise Levels for the JB Tonkin Compressor Station Modifications

Closest NSAs (Residences)	Distance and Direction from the Compressor Addition (feet)	Sound Level Contribution of Existing Station (dBA, L_{dn})	Baseline Noise with Mitigation Installed on Existing Station Components[a] (dBA, L_{dn})	Estimated Noise Level from Station Modifications (dBA, L_{dn})	Estimated Total Station Noise After Proposed Modifications[b] (dBA, L_{dn})	Change in Ambient Noise Level (dBA)
S2	1,300 (NW)	44.4	44.4	38.4	45.4	1.0
S3	1,400 (NNE)	42.7	41.7	37.4	43.1	0.4
S4	1,200 (NNE)	46.1	45.1	39.4	46.1	0.0
S5	1,300 (NE)	45.0	44.0	38.4	45.1	0.1
S6	1,100 (NE)	51.4	49.4	40.4	49.9	(1.5)
S7	1,000 (ENE)	48.4	46.4	41.4	47.6	(0.8)
S8	1,500 (ENE)	43.8	41.8	37.4	43.1	(0.7)
S9	1,300 (E)	47.9	45.9	38.4	46.6	(1.3)
S10	650 (E)	60.0	57.0	46.4	**57.4**	(2.6)
S11	600 (E)	68.5	64.5	47.4	**64.6**	(3.9)
S12	650 (ESE)	57.2	55.2	46.4	**55.7**	(1.5)
S13	1,000 (SE)	49.3	48.3	41.4	49.1	(0.2)
S14	450 (SE)	58.9	56.9	48.4	**57.5**	(1.4)
S15	1,400 (S)	45.2	43.2	37.4	44.2	(1.0)
S16	2,100 (WSW)	38.5	38.5	33.4	39.7	1.2
S17	1,700 (W)	39.6	39.6	36.4	41.3	1.7

a Existing station mitigation would include insulating aboveground piping and enclosing regulator valve actuators.

b Noise estimates include a gas measuring station at the compressor station site and proposed mitigation measures. Estimated total station noise after proposed modifications that would exceed the FERC level of 55 dBA L_{dn} are shown in **bold**.

To ensure that the actual noise levels resulting from operation of the JB Tonkin Compressor Station would not be significant, **we recommend that:**

- **DETI should file a noise survey with the Secretary <u>no later than 60 days</u> after placing the JB Tonkin Compressor Station in service. If a full load condition noise survey of the entire station is not possible, DETI should instead file an interim survey at the maximum possible horsepower load and file the full load survey <u>within 6 months</u>. If the noise attributable to the operation of all of the equipment at the JB Tonkin Compressor Station under interim or full horsepower load conditions exceeds existing levels at NSAs S10, S11, S12, and S14 or 55 dBA L_{dn} at any other nearby NSAs, DETI should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. DETI should confirm compliance with the above requirements by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

Tables 4.11.2-6 and 4.11.2-7 show the estimated noise impact at the nearest NSAs due to the full load operation of DETI's modified Crayne and Mockingbird Hill Compressor Stations, respectively.

TABLE 4.11.2-6

Estimated Noise Levels for the Crayne Compressor Station Modifications

Nearest NSAs (Residences)	Distance and Direction to the Compressor Addition (feet)	Sound Level Contribution of Existing Station (dBA, L_{dn})	Estimated Noise Level from Station Modifications (dBA, L_{dn})	Estimated Station Noise Level After Proposed Modifications (dBA, L_{dn})[a]	Noise Increase (dBA)
S1	1,700 (NNW)	46.5	32.4	46.7	0.2
S2	1,450 (N)	43.6	33.4	44.0	0.4
S3	1,100 (NNE)	42.4	36.4	43.4	1.0
S4	900 (NNE)	41.7	38.4	43.4	1.7
S5	800 (NE)	45.4	40.4	46.6	1.2
S6	500 (ENE)	50.6	44.4	51.5	0.9
S8	450 (ESE)	52.3	45.4	53.1	0.8
S9	1,800 (ENE)	50.1	31.4	50.2	0.1
S10	3,100 (SE)	45.2	25.4	45.2	0.0
S11	3,600 (SSE)	42.6	23.4	42.7	0.1
S12	1,900 (SSW)	49.8	31.4	49.9	0.1
S13	2,000 (SSW)	49.3	30.4	49.4	0.1
S14	1,900 (SW)	52.6	31.4	52.6	0.0
S15	2,500 (SW)	46.6	27.4	46.7	0.1
S16	3,200 (W)	38.7	24.4	38.9	0.2

[a] Noise estimates include proposed mitigation measures.

TABLE 4.11.2-7

Estimated Noise Levels for the Mockingbird Hill Compressor Station Modifications

Nearest NSAs (Residences)	Distance and Direction to the Compressor Addition (feet)	Estimated Total Noise Level of Existing Station (dBA, L_{dn})[a]	Estimated Noise Level from Station Modifications (dBA, L_{dn})	Estimated Station Noise Level After Proposed Modifications (dBA, L_{dn})	Noise Increase (dBA)
S1	4,500 (WNW)	49.9	25.4	49.9	0.0
S5	750 (NNW)	49.6	46.4	51.3	1.7
S6	2,600 (SSE)	46.1	33.4	46.3	0.2
S7	2,800 (S)	47.0	32.4	47.1	0.1
S8	2,400 (SSW)	46.2	34.4	46.5	0.3
S9	2,500 (SSW)	43.1	33.4	43.5	0.4
S10	3,000 (SSW)	45.6	31.4	45.8	0.2

[a] This estimate includes noise increases from gas coolers that were installed at the existing station in 2016 as part of the Monroe to Cornwell Project.

[b] Noise estimates include proposed mitigation measures.

As demonstrated in tables 4.11.2-6 and 4.11.2-7, noise levels at the Crayne and Mockingbird Hill Compressor Stations would meet the FERC guidelines at each NSA. In addition, the noise increase at each NSA would be less than 3 dBA and would likely not be perceptible. To ensure that the actual noise levels resulting from operation of the Crayne and Mockingbird Hill Compressor Stations are not significant, **we recommend that:**

- **DETI should file a noise survey with the Secretary no later than 60 days after placing each of the Crayne and Mockingbird Hill Compressor Stations in service. If a full load condition noise survey of the entire station is not possible, DETI should instead file an interim survey at the maximum possible horsepower load and file the full load survey within 6 months. If the noise attributable to the operation of all of the equipment at the Crayne and Mockingbird Hill Compressor Stations under interim or full horsepower load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, DETI should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. DETI should confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

We received numerous comments regarding excessive, harmful noise from ACP and SHP compressor stations. Each compressor station associated with the projects would meet the FERC guidelines, except for the JB Tonkin Compressor Station in Westmoreland County, Pennsylvania, where the noise level currently exceeds FERC guidelines at four NSAs. However, at these locations, DETI estimates that the station noise would be reduced from current levels. In addition, the noise increases for all stations range from 0 to 8.5 dBA, with most NSAs experiencing increases near or below 3 dBA, which is the threshold of perception for the human ear. As such, we find that noise levels attributable to ACP and SHP compressor stations at the nearest NSAs would not be significant.

We received comments stating that ACP and SHP compressor stations would cause vibrations, specifically Compressor Station 2 (Buckingham County, Virginia). FERC regulations require that no perceptible increase in vibration may occur as a result of compressor station operation. The proposed compressor units at all compressor stations, including Compressor Station 2, would be combustion turbines. As such, we do not expect there to be an issue with vibration, as it is more characteristic of reciprocating engines. Through FERC's dispute resolution service helpline, we are aware that induced vibration, or a low frequency sound from compressor stations, has occurred at a limited number of natural gas facilities in the over 300,000 miles of transmission pipeline in the United States. However, we are unaware of wide-scale cases of low frequency noise from natural gas transmission facilities. With hundreds of thousands of residents near natural gas pipelines and compressor stations, we have seen no system evidence that natural gas pipelines or compressor stations are inducing noise effects on local residences. This appears to be an isolated issue that continues to be addressed through the dispute resolution service and landowner helpline.

Landowners near the proposed and modified compressor stations expressed concern with the noise levels resulting from compressor station operations and blowdown events. Planned blowdowns occur because of maintenance activities; Atlantic and DETI would incorporate blowdown silencers to minimize noise during planned blowdowns. Projected sound levels associated with planned blowdown events are estimated to be about 31 dBA at 1,000 feet away and would remain below 55 dBA L_{dn} at the nearest NSAs. Planned blowdown events at each compressor station would be infrequent, lasting from 1 to 5 minutes. Specifically, the unit blowdown silencer at each station would be designed to limit blowdown noise to a maximum A-weighted sound level of 60 dBA at 50 feet. Unplanned blowdown events would be very infrequent and would occur in the event of an emergency. The sound levels associated with an unplanned, unsilenced station blowdown would be about 100 dBA at 1,000 feet away. Given the non-routine nature and short-term duration of these blowdown events, we do not believe that they would be a significant contributor to operational noise from the Projects.

Meter Stations

Atlantic's Kincheloe M&R Station and DETI's CNX M&R Station would be within ACP Compressor Station 1, and the Woods Corner M&R Station would be within ACP Compressor Station 2.

The noise levels associated with these M&R Stations are incorporated in the compressor station noise levels shown in table 4.11.2-4 above. It is our experience that M&R stations may vary widely in terms of the equipment used at each station, and the noise levels associated with M&R stations could result in noise impacts at nearby NSAs. In addition, the number of residences in proximity to M&R stations could justify the need for post-construction noise surveys to ensure that the noise attributable to the M&R stations is within acceptable limits. In addition to the Kincheloe and Woods Corner M&R Station, Atlantic would construct seven new M&R stations along the proposed pipelines.

On March 24, 2017, Atlantic filed noise surveys for its proposed M&R stations. The Long Run, Brunswick, Greensville, and Fayetteville M&R Stations do not have residences or other NSAs within 0.5 mile of the proposed sites. The results for the Elizabeth River, Pembroke, and Smithfield M&R Stations are provided in table 4.11.2-8 below. Although estimated M&R total station noise after proposed modifications would exceed the FERC level of 55 dBA Ldn in most cases, the M&R station would not contribute to this increase because the existing ambient noise levels already exceed this level.

TABLE 4.11.2-8

Estimated Noise Levels for the Proposed Atlantic Coast Pipeline M&R Stations

Nearest NSA	Distance and Direction from M&R Station (feet)	Existing Ambient Sound Level (dBA, L_{dn})	Estimated M&R Station Operational Noise[a] (dBA, L_{dn})	M&R Station Noise + Existing Ambient (dBA, L_{dn})	Noise Increase (dBA)
Elizabeth River M&R Station					
S1	1,450 (NE)	57.7	27.4	57.7	0.0
S2	1,750 (NE)	58.8	25.4	58.8	0.0
S3	1,650 (ESE)	60.7	25.4	60.7	0.0
S4	1,650 (SE)	58.0	25.4	58.0	0.0
S5	1,750 (SE)	54.9	25.4	54.9	0.0
S6	1,800 (SSE)	55.9	24.4	55.9	0.0
S7	2,450 (S)	54.4	21.1	54.4	0.0
S8	2,500 (SSW)	56.2	21.4	56.2	0.0
S9	2,150 (SW)	59.9	234	59.9	0.0
Pembroke M&R Station					
S1	1,200 (NE)	53.0	32.4	53.0	0.0
S2	800 (E)	49.7	36.4	49.9	0.2
S3	1,600 (SE)	49.6	29.4	49.6	0.0
S4	1,200 (SSE)	59.7	32.4	59.7	0.0
S5	1,250 (SSW)	61.5	32.4	61.5	0.0
S6	2,200 (W)	57.6	26.4	57.6	0.0
S7	2,150 (NW)	44.6	26.4	44.7	0.1
S8	1,600 (NNE)	60.8	29.4	60.8	0.0
Smithfield M&R Station					
S1	2,450 (NNW)	62.2	19.4	62.2	0.0
S2	1,250 (NNW)	56.7	26.4	56.7	0.0
S3	1,900 (S)	52.6	22.4	52.6	0.0
S4	1,700 (SW)	51.5	23.4	51.5	0.0
S5	2,600 (NW)	64.1	18.4	64.1	0.0

Note: Noise results are provided for M&R stations that contain NSAs within 0.5 mile.

Based on the analyses conducted, mitigation measures proposed, and our additional recommendations, we conclude that the projects would not result in significant noise impacts on residents, and the surrounding communities.

4.11.3 Air Quality and Noise on Federal Lands

4.11.3.1 Air Quality

Construction of ACP would have air quality impacts on the MNF and GWNF, as well as at the ANST and BRP. No compressor stations would be constructed on NFS lands or along the BRP; therefore, impacts on air quality would be limited to pipeline construction. The two entry sites for the ANST/BRP HDD would be about 0.4 and 0.5 mile away from the ANST and BRP, respectively. Construction air quality impacts would be limited primarily to the immediate construction area and would have a minimal impact on hikers and backpackers along the ANST. Emissions resulting from vehicle travel (construction equipment and on-road vehicles) would result in temporary impacts on the area and would subside once construction is complete. Similar to construction impacts discussed in section 4.11.1.3, fugitive dust and construction and commuter vehicle emissions would occur during typical pipeline construction. Atlantic would implement measures in its *Fugitive Dust Control and Mitigation Plan* (see table 2.3.1-1) to minimize construction air quality impacts. Fugitive dust would be localized and once construction is complete, related emissions would subside and air quality would return to preconstruction conditions. Operational emissions would be limited to fugitive pipeline methane leaks from valves and fittings. Pipeline leaks should not impede or impact use of the BRP or ANST. We conclude that construction and operation of ACP would not have a significant impact on air in the MNF and GWNF and along the ANST and BRP.

4.11.3.2 Noise

Construction of ACP would result in temporary noise increases along the pipeline right-of-way. Activities such as HDD, clearing, and trenching would impact local noise in the immediate vicinity of the workspace; however, the noise would dissipate with increased distance from the construction area. The BRP/ANST HDD would result in a noise increase near the entry and exit sites during construction. Noise impacts on hikers and trail users would occur throughout HDD construction activities; however, based on the distance of the trail from the entry and exit sites (about 0.4 and 0.5 mile, respectively), the noise levels experienced would be minimal. Increased traffic from commuter vehicles, trucks, and construction equipment would contribute to noise near the ANST and BRP, although we do not anticipate that this noise would be significant. Typical pipeline construction at any given location could take several months (through to restoration) and would occur during daylight hours. However, once construction is complete, noise would return to preconstruction levels. There would be no noise impacts due to operation of the pipeline. Noise impacts on wildlife are discussed in section 4.5.8 of this EIS. While HDD activities would occur on a 24-hour basis, based on the estimated HDD noise levels provided in table 4.11.2-3 and our HDD monitoring recommendation above, we conclude that there would be no significant impact on noise levels in the MNF and GWNF and along the ANST and BRP.

4.12 RELIABILITY AND SAFETY

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for an accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

CH_4, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death. To increase safety and make the methane detectable by odor, Atlantic and DETI would add a chemical odorant that produces the familiar natural gas smell. The natural gas in Atlantic's and DETI's proposed pipelines would contain a chemical odorant that produces a "natural gas smell."

CH_4 has an auto-ignition temperature of 1,000 °F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. At atmospheric temperatures, CH_4 is buoyant and disperses rapidly in air. An unconfined mixture of CH_4 and air is not explosive; however, it may ignite if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode.

4.12.1 Safety Standards

The DOT is mandated to provide pipeline safety under 49 U.S.C. 601. The DOT's PHMSA administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. PHMSA develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety.

The PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. DOT provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing, at a minimum, the federal standards. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, DOT is responsible for enforcement actions.

The DOT pipeline standards are published in 49 CFR 190-199. Part 192 specifically addresses the minimum federal safety standards for transportation of natural gas by pipeline.

Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* (Memorandum) dated January 15, 1993, between DOT and FERC, DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of FERC's regulations require that an applicant certify that it would design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. FERC accepts this certification and does not impose additional safety standards other than DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the public involving safety matters related to pipelines under the Commission's jurisdiction.

The FERC also participates as a member of DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

Atlantic and DETI have stated that the project facilities would be designed, constructed, operated, and maintained in accordance with DOT *Minimum Federal Safety Standards* in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT also defines area classifications, based on population density near pipeline facilities, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

Class 1 – Location with 10 or fewer buildings intended for human occupancy.

Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy.

Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.

Class 4 – Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For example, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (i.e., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4 locations). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; MAOP; inspection and testing of welds; and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Class locations for ACP and SHP pipelines have been determined based on the relationship of the pipeline centerline to other nearby structures and manmade features. Table 4.12.1-1 summarizes the class locations for ACP and SHP pipelines.

Most of the pipeline routes would be in a Class 1 area. If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, Atlantic and DETI would reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with DOT requirements for the new class location.

The DOT Pipeline Safety Regulations require operators to develop and follow a written Integrity Management Program that contain all the elements described in 49 CFR 192.911 and address the risks on each transmission pipeline segment. Specifically, the rule establishes an integrity management program that applies to all high-consequence areas (HCA).

The DOT has published rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 where the potential impact radius[40] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[41] or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.

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[40] The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in psig (gauge) multiplied by the square of the pipeline diameter in inches.

[41] The potential impact circle is a circle of radius equal to the potential impact radius.

TABLE 4.12.1-1

Lengths of Area Classifications Crossed by the Atlantic Coast Pipeline and Supply Header Project

Project/Facility	Class 1 (miles)	Class 2 (miles)	Class 3 (miles)
Atlantic Coast Pipeline			
AP-1	0.0-7.6	7.6-10.6	139.7-140.8
	10.6-25.9	25.9-27.3	146.8-147.0
	27.3-28.1	28.1-30.0	148.9-150.0
	30.0-76.5	76.5-76.9	
	76.9-108.0	108.0-108.7	
	108.7-109.5	109.5-110.0	
	110.0-111.5	111.5-112.2	
	112.2-126.5	126.5-127.9	
	127.9-129.1	129.1-130.7	
	130.7-134.1	134.1-135.0	
	135.0-136.7	136.7-137.6	
	137.6-139.7	150.0-150.8	
	140.8-146.8	151.2-153.9	
	147.0-148.9	156.3-157.7	
	150.8-151.2	162.1-164.1	
	153.9-156.3	199.8-201.5	
	157.7-162.1	246.0-247.4	
	164.1-199.8	280.1-281.9	
	201.5-246.0		
	247.4-280.1		
	281.9-300.1		
AP-2	0.0-2.3	2.3-3.4	51.2-52.4
	3.4-5.4	5.4-8.2	80.0-80.11
	8.2-12.8	12.8-13.8	167.2-167.2
	13.8-40.1	40.1-41.1	
	41.1-42.2	42.2-44.2	
	44.2-44.7	44.7-47.7	
	47.7-49.1	47.1-50.3	
	50.3-50.7	50.7-51.2	
	53.2-57.8	52.4-53.2	
	59.9-63.2	57.8-59.9	
	64.2-67.3	63.2-64.2	
	70.6-71.5	67.3-70.6	
	72.8-73.9	71.5-72.8	
	74.8-78.6	73.9-74.8	
	82.4-88.3	78.6-80.0	
	90.5-91.6	88.3-90.5	
	92.1-101.0	91.6-92.1	
	103.7-104.0	101.0-103.7	
	105.0-107.6	104.0-105.0	
	110.1-110.8	107.6-110.1	
	112.6-112.8	110.8-112.6	
	114.3-114.9	112.8-114.3	
	117.9-125.5	114.9-117.9	
	126.7-141.0	125.5-141.0	
	141.6-154.5	141.0-141.6	
	156.4-158.8	154.5-156.4	
	159.5-161.2	158.8-159.5	

TABLE 4.12.1-1 (cont'd)			
Lengths of Area Classifications Crossed by the Atlantic Coast Pipeline and Supply Header Project			
Project/Facility	Class 1 (miles)	Class 2 (miles)	Class 3 (miles)
	161.7-163.5	161.2-161.7	
	163.9-167.2	163.5-163.9	
	167.2-177.7	177.7-181.2	
	181.2-182.5	182.5-182.9	
AP-3	0.0-15.9	15.9-17.1	76.6-81.3
	17.1-37.9	37.9-38.3	82.7-82.7
	38.3-56.2	56.2-57.3	
	57.3-60.0	60.0-62.0	
	62.0-76.6	81.3-82.7	
AP-4	0.0-0.4		
AP-5	0.0-1.1		
Supply Header Project			
TL-635	0.0-10.6	29.3-29.7	10.6-10.7
	10.7-29.3		29.7-30.2
	30.2-33.6		
TL-636	0.0-0.8	0.8-1.7	
	1.7-2.5	2.5-3.9	

[a] The straight-line distance between consecutive mileposts may be greater than or less than 5,280 feet due to the adoption of route alternatives and variations. The mileposts should be considered as reference points only.

An "identified site" is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its integrity management program to those sections of the pipeline within HCAs. DOT regulations specify the requirements for the integrity management plan in Subpart O of Part 192, Gas Transmission Pipeline Integrity Management.

Table 4.12.1-2 lists the HCAs for ACP and SHP pipelines, which have been determined based on the relationship of the pipeline centerline to nearby structures and identified sites. No HCAs would be located along the AP-4 and AP-5 laterals.

The pipeline and aboveground facilities would be designed, constructed, operated, and maintained in accordance with the DOT's Minimum Federal Safety Standards in 49 CFR 192. The general construction methods that Atlantic and DETI would implement to ensure the safety of the projects are described in section 2.3, including welding, inspection, and integrity testing procedures.

TABLE 4.12.1-2 **High Consequence Areas Crossed by the Atlantic Coast Pipeline and Supply Header Project**				
Project/Facility	County/State	Begin Milepost	End Milepost	Length (miles)
Atlantic Coast Pipeline				
AP-1	Lewis County, West Virginia	8.2	9.8	1.6
		11.4	12.0	0.5
	Upshur County, West Virginia	22.6	23.4	0.8
		23.5	24.2	0.8
		26.7	27.1	0.5
	Pocahontas County, West Virginia	69.0	69.5	0.6
	Augusta County, Virginia	109.3	110.2	1.3
		113.3	113.6	0.6
		133.8	134.7	0.9
		136.7	137.5	1.0
		139.7	141.0	1.3
		144.9	145.8	1.0
		146.5	147.5	1.0
		148.7	150.0	1.0
		151.9	152.5	0.6
	Nelson County, Virginia	158.4	159.1	0.7
		162.9	163.7	0.8
	Cumberland County, Virginia	215.5	216.0	0.5
		216.7	217.4	0.7
	Nottoway County, Virginia	227.0	227.7	0.7
		246.7	247.5	0.8
AP-2	Northampton County, North Carolina	6.8	7.5	0.7
	Halifax County, North Carolina	13.3	13.7	0.5
	Nash County, North Carolina	43.1	43.6	0.6
		46.9	47.8	0.9
		49.8	50.5	0.7
		51.0	52.4	1.3
	Wilson County, North Carolina	67.8	68.4	0.6
	Johnston County, North Carolina	79.6	80.5	0.8
		88.3	88.8	0.6
		88.8	89.5	0.6
		95.9	96.5	0.7
		102.1	102.5	0.6
	Cumberland County, North Carolina	126.0	126.7	0.7
		131.5	132.4	0.9
		141.1	141.6	0.5
		144.7	145.4	0.7
		155.8	156.5	0.8
		158.9	159.6	0.7
	Robeson County, North Carolina	161.1	161.6	0.6
		163.4	163.9	0.5
		166.9	167.7	0.9
		179.6	180.1	0.5
		180.5	181.1	0.6
		182.5	183.0	0.5
AP-3	City of Suffolk, Virginia	63.1	63.4	0.3
	City of Chesapeake, Virginia	76.6	81.3	4.6
		82.2	82.7	0.5
AP-4 – None				
AP-5 – None				

TABLE 4.12.1-2 (cont'd) **High Consequence Areas Crossed by the Atlantic Coast Pipeline and Supply Header Project**				
Project/Facility	County/State	Begin Milepost	End Milepost	Length (miles)
Supply Header Project				
TL-635	Doddridge County, West Virginia	10.3	10.9	0.7
	Wetzel County, West Virginia	29.3	30.0	0.7
TL-636	Westmoreland, Pennsylvania	3.6	3.9	0.3

[a] The straight-line distance between consecutive mileposts may be greater than or less than 5,280 feet due to the adoption of route alternatives and variations. The mileposts should be considered as reference points only.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency system shutdown and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

We received comments regarding potential safety impacts associated with the installation of ACP and SHP pipelines in areas of karst terrain, including the potential for sinkhole formation to damage the proposed facilities. Section 4.1.2.3 includes a discussion of the potential for karst activity to damage ACP or SHP facilities.

We received comments regarding the potential for fires and controlled burns to affect the proposed pipeline facilities. DOT requirements do not include standards for the use of fire-resistant materials during the installation of underground natural gas pipelines. However, as discussed above, Atlantic and DETI would develop emergency plans that would include establishing and maintaining adequate means of communication with appropriate fire, police, and other public officials, and developing prompt and effective response to a notice of each type of emergency, including that of a fire located near or directly involving a pipeline facility. Atlantic and DETI would develop the emergency response plans in coordination with local emergency response officials, thereby ensuring that its proposed response to a pipeline emergency would be acceptable.

The DOT also requires pipeline operators to place pipeline markers at frequent intervals along the pipeline rights-of-way, such as where a pipeline intersects a street, highway, railway or waterway, and at other prominent points along the route. Pipeline right-of-way markers can help prevent encroachment and excavation-related damage to pipelines. Because the pipeline right-of-way is much wider than the pipeline itself, and a pipeline can be located anywhere within the right-of-way, state laws require excavators to call their state One Call center well in advance of digging to locate underground utilities and ensure it is safe for the contractor to dig in that location.

In accordance with DOT regulations, the proposed facilities would be regularly inspected for leakage as part of scheduled operations and maintenance, including:

- physically walking and inspecting the pipeline corridor periodically;
- conducting fly-over inspections of the right-of-way as required;
- inspecting valves and maintaining compressor engines; and
- conducting leak surveys at least once every calendar year or as required by regulations.

During inspections, employees would look for signs of unusual activity on the right-of-way and would immediately respond to assess the nature of the activity and remedy with prescribed corrective action.

In addition to the DOT-required surveys described above, Atlantic and DETI would monitor their pipeline systems from their existing Gas Control Centers. These control centers monitor the pipeline systems with sophisticated computer and telecommunications equipment that can detect fluctuations and control flows. Using this equipment, the control centers can detect pressure drops along the pipelines and stop the flow of gas to the problem area by isolating sections along the pipe. The control centers operate 24 hours a day, 7 days a week.

Cathodic protection[42] would be installed along the entire length of the new pipelines to prevent corrosion. Atlantic and DETI personnel would check the voltage and amperage at regular intervals as well as the pipe-to-soil potentials and rectifiers. In addition, annual surveys are completed, as described above.

Pipeline markers identifying the owner of the pipe and a 24-hour telephone number would be placed for "line of sight" visibility along the entire pipeline length, except in active agricultural crop locations and in waterbodies in accordance with DOT requirements.

Safety standards specified in Part 192 require that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance in responding to emergencies. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

In addition, Atlantic and DETI have developed emergency response plans that are used for their entire systems. Atlantic's and DETI's operating personnel attend training for emergency response procedures and plans. During construction of the pipelines, Atlantic and DETI would continue to implement the measures in its emergency response plans associated with the existing pipelines. In addition, Atlantic and DETI are currently meeting with local emergency planning committees, which include fire departments, police departments, and public officials, to develop emergency response plans to be used during construction of the projects. Prior to completion of construction, Dominion Operations would provide information, including the pipeline location, to the same local emergency planning committees to support the development of Operational Emergency Response Plans. Atlantic and DETI would also meet with the committees to review plans and would work with these committees to communicate the specifics about the pipeline facilities in the area and the need for emergency response including community

[42] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline that includes the use of an induced current and/or a sacrificial anode that corrodes preferentially.

notification in the event of an incident. Atlantic and DETI would also meet periodically with the groups to review the plans and revise their plans when necessary. Local emergency planning committee personnel would be involved in any operator-simulated emergency exercises and post-exercise critiques, if conducted. Atlantic and DETI would use all available, reasonable, and relevant means to support the pipeline and facilities if an emergency occurs.

Atlantic and DETI would establish and maintain liaison with appropriate fire, police, and public officials in a variety of ways. Atlantic's and DETI's annual communications would include the following information:

- the potential hazards associated with project facilities located in their service area and prevention measures undertaken;
- the types of emergencies that may occur on or near the Atlantic or DETI facilities;
- the purpose of pipeline markers and the information contained on them;
- pipeline location information and the availability of the National Pipeline Mapping System;
- recognition of and response to pipeline emergencies; and
- procedures to contact Atlantic and DETI for more information.

Atlantic's and DETI's communications with local emergency responders may involve individual meetings, group meetings, or direct mailings. Atlantic and DETI would utilize their existing Gas Control Centers to monitor and isolate sections of pipeline that are difficult to access including river crossings and the portion of the pipeline that would be installed using the HDD method to cross the ANST and BRP. Atlantic and DETI would work with local responders in these areas to identify response requirements and procedures as described above.

We received comments during scoping and on the draft EIS from residents and emergency response representatives of Wintergreen Resort; Bath County, Virginia; and several community members and landowners regarding single-point access roads and the ability to evacuate in event of an emergency. In a letter sent to Bath County Supervisor, Stuart Hall, Atlantic documented that these concerns would be addressed on a case-by-case basis. In the letter, Atlantic states that their intention is to work with local emergency responders to ensure they are comfortable with their ability to respond to a natural gas emergency, including evacuation. As discussed above, Atlantic plans to accomplish this by holding annual meetings and setting up table-top drills to work through the action items necessary to resolve a natural gas emergency scenario. As discussed above, Atlantic and DETI would prepare Operational Emergency Response Plans in coordination with local emergency response providers. The Operational Emergency Response Plans would address incident evacuation requirements. As discussed in section 4.12.3, we have concluded that operation of the project would represent only a slight increase in risk to the nearby public. However, in the unlikely case of an operational incident, Atlantic and DETI would coordinate with landowners and local emergency response services to implement the Local Emergency Response Providers Emergency Response Plan to address the specific situation. In circumstances where ingress and egress may be impaired during construction, Atlantic and DETI have stated that temporary measures would be taken to ensure continued ingress and egress for landowners. On NFS lands, the FS would require construction-related ingress and egress locations and durations, as well as detour and traffic control plans.

We received several comments about impacts on residences and public safety resulting from operation of the proposed compressor stations. As discussed above, ACP and SHP aboveground facilities would be designed, constructed, operated, and maintained in accordance with DOT *Minimum Federal Safety Standards* in 49 CFR 192. Based on Atlantic's and DETI's compliance with federal design and safety standards, we conclude that constructing and operating the proposed compressor stations would not significantly impact public safety.

We received comments from the City of Chesapeake in addition to individuals and landowners near Buckhannon High School and the three-school complex in Stuarts Draft regarding the safety of ACP and SHP pipelines during construction, including children's safety. In addition, we received comments from landowners about the need for safety inspections of the construction activities. Atlantic's and DETI's contractors, including construction workers, would be required to adhere to federal and state safety regulations and recommendations. In addition, if the project is approved, FERC staff or its contractors would routinely inspect construction activities to ensure compliance with the conditions in the Commission's Order.

We received comments on the draft EIS regarding impacts of heavy farm equipment and other large vehicles crossing the pipeline in open areas (i.e., not at road crossings). Atlantic and DETI have stated that normal farm equipment may cross the pipeline without prior notification from landowners. In addition, Atlantic and DETI have begun meeting with local emergency planning committees to discuss various situations that may arise during and post construction, including the use of farm equipment of the pipeline. Further, Atlantic and DETI would discuss provisions to ensure emergency responders have access.

As part of its easement negotiations with landowners and project planning, Atlantic and DETI stated they would provide stabilized crossings for existing driveways and access roads where heavy loads are anticipated. Atlantic and DETI stated that if a heavy load is proposed after construction, the landowner would need to contact Dominion Energy Field Engineering, after which an engineer would analyze the equipment specifications (e.g., weight, wheel configuration, number of axles) and pipeline specifications (e.g., pipe wall thickness, depth, soil type) to determine if it is safe to cross the pipeline. If it is determined that it is not safe to cross, the engineer may then provide a list of temporary or permanent mitigation measures to utilize and make it safe to cross (e.g., a timber mat or a layer of stone or dirt). For the portion of ACP on NFS lands, current and future crossings of the pipeline corridor (e.g., roads, trails, skid roads) may be constructed, reconstructed, maintained, decommissioned, etc. anywhere across the length of the proposed pipeline project on the MNF and GWNF. The FS would coordinate with Atlantic regarding any such crossings to address safety considerations.

Based on Atlantic's and DETI's compliance with federal design and safety standards and its implementation of the aforementioned safety measures, we conclude that constructing and operating the proposed pipelines and compressor stations would not significantly impact public safety.

4.12.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the National Response Center at the earliest practicable moment following the discovery of an incident and to submit a report within 30 days to the PHMSA. Incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- involve property damage, including cost of gas lost, of more than \$50,000, in 1984 dollars;[43]
- release 5 barrels or more of a highly volatile liquid or 50 barrels or more of other liquid; or

[43] \$50,000 in 1984 dollars is approximately \$118,811 in 2017 (Bureau of Labor Statistics, 2017).

- results in an unintended fire or explosion.

Incidents may also include events that are significant in the judgment of the operator, even though they did not meet the criteria above. During the 20-year period from 1997 through 2016, a total of 1,329 significant incidents were reported on the more than 315,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.2-1 provides a distribution of the causal factors as well as the number of each incident by cause from 1997 to 2016.

The dominant causes of pipeline incidents from 1997 to 2016 were corrosion and pipeline material, weld, or equipment failure, constituting 52.2 percent of all significant incidents. The pipelines included in the data set in table 4.12.2-1 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

TABLE 4.12.2-1

Natural Gas Transmission Pipeline Significant Incidents by Cause (1997-2016) [a]

Cause	Number of Incidents	Percentage
Corrosion [b]	317	23.9
Excavation	204	15.3
Pipeline material, weld, or equipment failure	376	28.3
Natural force damage	149	11.2
Outside Force [c]	86	6.5
Incorrect operation	44	3.3
All other causes [d]	153	11.5
TOTAL	1,329	100

[a] All data gathered from PHMSA Serious Incident files, April 28, 2017.
[b] Includes third-party damage.
[c] Fire, explosion, vehicle damage, previous damage, intentional damage.
[d] Miscellaneous causes or other unknown causes.
Source: PHMSA, 2016.

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process. Jones et al. (1986) compared reported incidents with the presence or absence of cathodic protection and protective coatings. The results of that study, summarized in table 4.12.2-2, indicated that corrosion control was effective in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe. The data also indicate that cathodically protected pipe without a protective coating has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12.2-2 **Incidents Caused by External Corrosion and Level of Protection (1970 through June 1984)**	
Corrosion Control	Incidents per 1,000 Miles per Year
None – bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

Source: Jones et al., 1986

Older pipelines also have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which are more easily crushed or broken by mechanical equipment or earth movements.

Outside force, excavation, and natural forces were the cause in 33.0 percent of significant pipeline incidents from 1997 to 2016. These result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geological hazards; and weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.2-3 provides a breakdown of outside force incidents by cause.

TABLE 4.12.2-3 **Outside Forces Incidents by Cause [a] (1997-2016)**		
Cause	Number of Incidents	Percent of All Incidents
Third party excavation damage	164	37.4
Operator/Contractor excavation damage	25	5.7
Unspecified excavation damage/Previous damage	15	3.4
Heavy Rain/Floods	78	17.8
Earth Movement	32	7.3
Lightning/Temperature/High Winds	28	6.4
Natural force	11	2.5
Vehicle (not engaged with excavation)	50	11.4
Fire/Explosion	9	2.1
Previous mechanical damage	6	1.4
Fishing or maritime activity	7	1.6
Intentional damage	1	0.2
Unspecified/Other outside force	13	3.0
TOTAL	**439**	**100**

[a] Excavation, Outside Force, and Natural Force from table 4.12.2-1

Source: PHMSA, 2016.

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities near pipelines. The One Call program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

We received comments regarding the safety history on DETI's existing pipeline systems. The Commission reviews each project based on its own merits and has siting authority for interstate natural gas infrastructure. PHMSA would be notified of and investigate all pipeline accidents and take any necessary resulting action. Although this information is not relevant to the scope of ACP or SHP, pipeline operator compliance and incident history is publicly available on PHMSA website at www.phmsa.dot.gov/pipeline.

We received comments on the potential for the underground pipelines to be impacted by forces of nature, specifically lightning, hurricanes, and flooding. As noted previously, the new pipelines would be constructed to meet the safety standards established by PHMSA in 49 CFR 192, which includes measures to protect pipelines from flooding events. In addition, we received comments regarding potential impacts on the pipeline from landslide events in the project areas. Section 4.1.4.2 includes a discussion of the potential for landslide activity to damage ACP or SHP facilities.

In addition, we received comments on the potential for the underground pipelines to be impacted by outside forces, specifically vehicle traffic at road crossings. As noted previously, the new pipeline would be constructed to meet the safety standards established by PHMSA in 49 CFR 192, which includes measures to protect pipelines from vehicle traffic or other similar causes.

4.12.3 Impact on Public Safety

The service incident data summarized in table 4.12.2-1 include pipeline failures of all magnitudes with widely varying consequences. Table 4.12.3-1 presents the average annual fatalities that occurred on natural gas transmission lines between 2011 and 2016. The data have been separated into employees and nonemployees to better identify a fatality rate experienced by the public. Fatalities among the public averaged two per year over the 20-year period from 1997 to 2016.

TABLE 4.12.3-1

Injuries and Fatalities – Natural Gas Transmission Pipelines

	Injuries		Fatalities	
Year	Employees	Public	Employees	Public
2011	1	0	0	0
2012	1	6	0	0
2013	0	2	0	0
2014	1	0	1	0
2015	1	13	4	2
2016	2	1	2	1

Source: PHMSA, 2016.

Most fatalities from natural gas pipelines are associated with local distribution pipelines. These pipelines are not regulated by FERC; they distribute natural gas to homes and businesses after transportation through interstate transmission pipelines. In general, these distribution lines are smaller-diameter pipes and/or plastic pipes that are more susceptible to damage. In addition, local distribution systems do not have large rights-of-way and pipeline markers common to FERC-regulated interstate natural gas transmission pipelines.

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table 4.12.3-2 to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. As indicated in table 4.12.3-2, the number of fatalities associated with natural gas facilities is much lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

TABLE 4.12.3-2

Nationwide Accidental Deaths [a]

Type of Accident	Annual No. of Deaths
All accidents	135,928
Motor vehicle	35,396
Poisoning	42,032
Falls	31,959
Drowning	3,406
Fire, smoke inhalation, burns	2,701
Floods [b]	176
Lightning [b]	27
Tornado [b]	36
Natural gas distribution lines [c]	11
Natural gas transmission pipelines [c]	2

[a] All data, unless otherwise noted, reflects 2014 statistics from: Kochanek et al., 2016.
[b] Reflects 2015 statistics from: National Weather Service, 2016.
[c] 20-year average, 1997-2016. PHMSA, 2016.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1997 to 2016, there were an average of 66 significant incidents and 2 fatalities per year. The number of significant incidents distributed over the more than 315,000 miles of natural gas transmission pipelines indicates the risk is low for an incident at any given location. The rate of total fatalities for the nationwide natural gas transmission lines in service is approximately 0.01 per year per 1,000 miles of pipeline. Using this rate, implementing the proposed 642.0-mile-long ACP and SHP pipelines might result in a fatality (either an industry employee or a member of the public) on the pipeline every 156 years. The operation of the project would represent only a slight increase in risk to the nearby public.

4.12.4 Terrorism and Security Issues

Safety and security concerns have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. The Office of Homeland Security is tasked with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. Among its responsibilities, the Department of Homeland Security oversees the Homeland Infrastructure Threat and Risk Analysis Center, which analyzes and implements the National Critical Infrastructure Prioritization Program that identifies and lists Tier 1 and Tier 2 assets. The Tier 1 and Tier 2 lists are key components of infrastructure protection programs and are used to prioritize infrastructure protection, response, and recovery activities. The Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

The Commission, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the Commission has taken measures to limit the distribution of information to the public regarding facility design to minimize the risk of sabotage. Facility design and location information has been removed from the FERC's website to ensure that sensitive information filed as Critical Energy Infrastructure Information is not readily available to the public (Docket No. RM06-23-000, issued October 30, 2007 and effective as of December 14, 2007).

The likelihood of future acts of terrorism or sabotage occurring at the Atlantic or DETI facilities, or at any of the myriad natural gas pipeline or energy facilities throughout the United States, is unpredictable given the disparate motives and abilities of terrorist groups. Further, the Commission, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

In accordance with the DOT surveillance requirements, Atlantic and DETI would incorporate air and ground inspection of its proposed facilities into its inspection and maintenance program. Security measures at the new aboveground facilities would include secure fencing.

Despite the ongoing potential for terrorist acts along any of the nation's natural gas infrastructure, the continuing need for the construction of these facilities is not eliminated. Given the continued need for natural gas conveyance and the unpredictable nature of terrorist attacks, the efforts of the Commission, the DOT, and the Office of Homeland Security to continually improve pipeline safety would minimize the risk of terrorist sabotage of ACP and SHP pipelines to the maximum extent practical, while still meeting the nation's natural gas needs. Moreover, the unpredictable possibility of such acts does not support a finding that this particular project should not be constructed.

4.13 CUMULATIVE IMPACTS

In accordance with NEPA, we considered the cumulative impacts of ACP and SHP when combined with other projects or actions in the area. Cumulative impacts represent the incremental effects of a proposed action when added to impacts associated with past, present, or reasonably foreseeable future projects, regardless of what agency or person undertakes such other actions. Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant. The direct and indirect impacts of ACP and SHP are discussed in other sections of this EIS.

This cumulative impacts analysis uses an approach consistent with the methodology set forth in relevant guidance (CEQ, 1997b, 2005; EPA, 1999). Under these guidelines, inclusion of actions within the analysis is based on identifying commonalities between the impacts that would result from the projects and the impacts likely to be associated with other potential projects.

To avoid unnecessary discussions of insignificant impacts and projects, and to adequately address and accomplish the purposes of this analysis, the cumulative impacts analysis for ACP and SHP was conducted using the following geographic and temporal guidelines.

- Projects and activities included in this analysis are generally those of comparable magnitude or nature of impact as ACP and SHP. The analysis also includes the proposed nonjurisdictional facilities associated with ACP and SHP (see section 2.8). The projects considered are discussed in section 4.13.2.

- The future timeframe within which another planned or proposed project could result in a cumulative impact relative to ACP and SHP depends in part on whether the impacts are temporary, short-term, long-term, or permanent. Most of the impacts associated with ACP and SHP, other than forest clearing and air/noise impacts related to compressor station operation, are temporary to short-term effects that would occur during the period of construction or be restored immediately following construction. Atlantic and DETI propose to start initial construction activities in November 2017 with pipeline construction commencing in April 2018, pending receipt of all applicable federal authorizations. Construction of ACP would last about 18 months and construction of SHP would last about

14 months, continuing through 2019. Atlantic and DETI would request to place the facilities into service following a determination that restoration is proceeding satisfactorily. We expect an in-service request would follow shortly after the end of construction. Therefore, this cumulative impact analysis considers current and other reasonably foreseeable projects that may be constructed within the geographic scope (or "regions of influence") up through about mid-2019.

- Another project must impact the same resource category as ACP and SHP for there to be a cumulative impact on that resource category. For the most part, this is possible when other projects are within the same general location (i.e., within a defined geographic scope) as ACP and SHP. The effects of more distant projects generally are not assessed because their impacts are or would be localized and would not contribute significantly to impacts in ACP and SHP project area(s). An exception is air quality, which can affect larger areas; thus, the geographic scope of influence for air quality is larger than for other resources (see table 4.13-1 and the associated discussion regarding resource-specific geographic scopes of influence). Per the EPA, project-specific analyses are usually conducted on the scale of counties, forest management units, or installation boundaries, whereas cumulative effects analysis should be conducted on the scale of human communities, landscapes, watersheds, or airsheds. Table 4.13-1 defines the potential geographic scope/region of influence for each resource analyzed in this section.

TABLE 4.13-1

Geographic Scope of Influence by Resource for Cumulative Impacts Associated with the Atlantic Coast Pipeline and Supply Header Project

Resource	Geographic Scope of Influence
Geology	Same construction footprint as the projects
Soils and Sediments	Same construction footprint as the projects
Groundwater (includes karst)	HUC-10 watersheds
Surface Water	HUC-10 watersheds
Wetlands	HUC-10 watersheds
Vegetation	HUC-10 watersheds
Wildlife	HUC-10 watersheds
Fisheries and Aquatic Resources	HUC-10 watersheds
Special Status Species	HUC-10 watersheds
Land Use and Special Interest Areas	Same construction footprint as the projects
Visual Resources	Within 0.5 mile of the projects, with exception of compressor stations, which extends to a 5-mile-wide radius around each facility. Specific areas also extend beyond 0.5-mile as assessed in the VIA.
Socioeconomics	County
Cultural Resources	Defined Area of Potential Effect [a]
Air Quality	Construction: Within 0.5 mile of the projects Operation: AQCR focused around the projects' compressor stations
Noise	Within 0.5 mile of NSAs associated with projects compressor stations
Climate Change	AQCR
Reliability and Safety	HUC-10 watersheds

[a] The APE may differ based on the type of resource considered; for example, impacts on buried artifacts would generally be considered only within the direct footprint where project impacts overlap, while impacts on an historic district would necessitate a wider scope.

The United States is divided and sub-divided into successively smaller hydrologic units that are a geographic area representing part of all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature. The unit used for our analysis in this EIS is referred to as HUC-10, or watershed.[44] A HUC-10 level watershed is an area of land where all streams and rainfall drain into a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel.[45] The watershed consists of surface water (lakes, streams, reservoirs, wetlands, etc.) and all the underlying groundwater.[46] Watersheds are important because the flow and quality of water are affected by natural and human-induced activities happening in the surface land above.[47] Each watershed tends to be 40,000 to 250,000 acres in size.[48] While there are other hydrologic units, such as HUC-8 (or a sub-basin) and HUC-12 (or a subwatersheds), we determined these areas were either too large in scope (448,000-acre areas) or too discrete in size (10,000- to 40,000-acre areas), respectively, to identify the cumulative impacts associated with ACP and SHP.[49]

Because surface activities can affect the connectivity of resources within a watershed, we determined that HUC-10 level watersheds crossed by ACP and SHP are appropriate to determine the suitable geographic scope for several resources including groundwater, surface water, wetlands, vegetation, wildlife, fisheries and aquatic resources, and special status species, as well as reliability and safety. As such, other past, present, and reasonably foreseeable projects that overlap with the HUC-10 watersheds crossed by ACP and SHP could contribute to cumulative impacts on these resources.

In addition, the geographic scope we used for other resources discussed in this EIS are as follows:

- Geology, soils, land use, recreation, and certain cultural resources: confined to the construction footprint because the features associated with these resources are confined to a specific location. Further, erosion control measures included in the FERC *Plan* and Atlantic's and DETI's *Restoration and Rehabilitation Plan*, for example, would keep disturbance within the approved work areas.

- Visual resources: within 0.5 mile of ACP and SHP for pipeline activities and a 5-mile radius around compressor stations, based on the extent in which project facilities would typically be visible based on landscape and vegetation. Exceptions to this exist where visual assessments have been done at KOPs to identify the impacts associated with deviations from the valued landscape character associated with tree clearing and right-of-way maintenance on NFS lands.

- Socioeconomics: confined to the counties in which ACP and SHP traverse; the focus is on the areas that would experience the greatest impacts associated with employment, housing, public services, transportation, traffic, property values, economy and taxes, and environmental justice.

- Air quality: the AQCR around ACP and SHP compressor stations, which is a broad area that includes the states crossed by ACP and SHP and/or nearby states that share common air pollution problems. Per the EPA, AQCRs are an appropriate boundary for assessment of the cumulative effects of releases of pollutants to the atmosphere.

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44 http://water.usgs.gov/GIS/huc.html. Accessed 8/5/16.
45 http://water.usgs.gov/edu/watershed.html. Accessed 8/5/16.
46 http://water.usgs.gov/edu/watershed.html. Accessed 8/5/16.
47 http://water.usgs.gov/edu/watershed.html. Accessed 8/5/16.
48 http://www.mowin.org/pdf/hucprimer.pdf. Accessed 8/5/16.
49 http://www.mowin.org/pdf/hucprimer.pdf. Accessed 8/5/16.

- Noise: encompasses an area 0.5 mile around NSAs associated with ACP and SHP compressor stations.

The relatively large geographic scope/region of influence used in this analysis such as HUC-10 watersheds and AQCRs were based on scaling to the relatively large size of the two projects, which extend for a combined 642.0 miles of new pipeline across four states (West Virginia, Virginia, North Carolina, and Pennsylvania). The proposed ACP pipeline routes cross 63 HUC-10 watersheds and SHP pipeline routes cross 10 HUC-10 watersheds. The 73 HUC-10 watersheds represent a combined total of about 8,248,332 acres. ACP and SHP account for about 12,010 acres of impacts (about 0.1 percent) of these watersheds. Combining the area of impact for all FERC-regulated projects (the largest in scope), indicates that over 35,000 acres of land would be affected within the watersheds. This equates to impacts on a small percentage (about 0.4 percent) of the watersheds affected by the projects.

The scope of the cumulative impact assessment depends in part on the availability of information about other projects. For this assessment, other projects were identified from information provided by the Atlantic and DETI; field reconnaissance; internet research; FERC staff's knowledge of other planned, pending, and ongoing jurisdictional natural gas projects; and communications with federal, state, and local agencies. The impacts were quantified to the extent practicable where cumulative impacts were potentially indicated. In most cases, the potential impacts could be described qualitatively but not quantitatively. This is particularly true for projects that are in the planning stage or are contingent upon economic conditions, availability of financing, or the issuance of permits.

As described throughout this EIS, ACP and SHP would temporarily and permanently impact the environment. As detailed in section 4 for each resource discussion, we found that most impacts would be temporary to short-term during construction and restoration of the projects. Long-term to permanent impacts were found where the operational easement would be cleared of forest, and where compressor stations would emit air pollutants during operation. Permanent impacts would occur at aboveground facilities and permanent new access roads. However, we conclude that with the mitigation measures proposed by Atlantic and DETI, our recommendations, and/or measures required by other agency permits, most impacts would not be significant with the following exceptions. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, and has sited the pipeline to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the additional factors described in sections 4.1 and 4.2, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur. Similarly, long-term impacts related to slope instability adjacent to waterbodies have the potential to adversely impact water quality and stream channel geometry, and therefore downstream aquatic biota.

Atlantic and DETI would remove approximately 6,140 acres of forested vegetation and wildlife habitat, including approximately 4,920 acres of large (mature) trees. Through forest fragmentation, ACP and SHP would create an additional 30,000 acres of additional forest edge that would be susceptible to edge effects. Atlantic and/or DETI are also likely to adversely affect the ESA-listed Indiana bat, northern long-eared bat, Roanoke logperch, Madison cave isopod, clubshell mussel, small whorled pogonia, and running buffalo clover. ACP could also significantly impact karst, cave, and subterranean habitat and its associated species through disturbance associated with trenching, blasting, or grading, discharge of water, and introduction of sedimentation and contaminants. Similarly, impacts on habitat of wildlife species with limited mobility and home ranges could result in population-level effects to certain species, such as from impacts on vernal pools and rocky outcrops. Also, the FS has determined that impacts on the eligibility of the ANST with respect to the NRHP would be temporary but adverse.

Impacts resulting from the projects would mostly be limited to the construction right-of-way, ATWS, contractor yards, and new access roads. In terms of other projects that were recently constructed, or may be constructed in the near future, we also considered permanent impacts on specific environmental resources (i.e., removal of forest). The projects that would potentially cause a cumulative impact when considered with the proposed projects are identified in table W-1 in appendix W.

We received comments on the draft EIS requesting that further indirect or secondary effects of the project be considered such as population growth, increased industry, housing, and associated infrastructure to deliver natural gas to residential customers. The EIS was prepared in accordance with NEPA, CEQ guidelines, and other applicable requirements. The EIS is consistent with FERC style, formatting, and policy regarding NEPA evaluation of alternatives and different types of impacts, including cumulative impacts for a linear "corridor-type" project. With regards to additional infrastructure, economic and population growth, etc., while these could be considered reasonably foreseeable in general, the timing, location, and extent of these factors is highly speculative. For example, the existing infrastructure may be able to accommodate with little to no modification (and impact on the environment) the new and increased access to energy realized by the project. Further, where these growth areas might occur, and how much additional growth relative to what infrastructure already exists is not known in enough detail to speculate what environmental impacts may result.

As explained above, FERC considered projects of comparable magnitude, projects that would occur during the same general timeframe as the proposed project (regardless of size), and projects that affect similar resources within the same defined geographic area of scope. We do not deny that a pipeline project such as the ACP and SHP could have an indirect or secondary impact later in time. However, when and if these additional activities or projects occur, they would be the result of many factors, not just the pipeline project, and would be subject to an environmental review by the federal, state, or local agency permitting their activity when they are identified as needed.

4.13.1 Past Actions That Contributed to the Current Environmental Setting

To understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The current environment of the project area reflects a mixture of natural processes and human influences across a range of conditions. Current conditions have been affected by innumerable activities over thousands of years, as explained below. This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. A catalog and analysis of all past actions would be impractical to compile. Current conditions have been affected by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Finally, the CEQ issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions" (CEQ, 2005). This guidance, allowing for a broad approach without delving into the historical details of individual past actions, is adopted here.

The region of influence for ACP and SHP has been affected by human activities for over 15,000 years, beginning with the original settlement of North America by Native Americans. The indigenous communities were affected by European settlement beginning in the 17th century. Human modifications to the landscape include the imprints of farming and timbering activities. As a result, most of the forest in the project area is tertiary or secondary. Over time, the human impact on native species included hunting and fishing, and the introduction of non-indigenous plants, animals, and insects. As population settlements grew, resources such as wetlands and forests were modified or converted. Between 1956 and 1979, about 97,000 acres of wetlands in Pennsylvania, West Virginia, and Virginia were lost (Tiner, 1987). In North Carolina, nearly half of the wetlands have been lost since pre-Colonial times (NCDEQ, 2016b). Since the 1970s, North Carolina has also lost wetlands that equate to about 4 percent of the total inland freshwater wetlands and 1.5 percent of coastal wetlands (Osmond et al., 1995). In Virginia, since 2001, 484,965 acres of forested land has been lost to changes in land use; 64 percent to urban development and 30 percent to agriculture (VDOF, 2016). Since 1990, urban land use in Pennsylvania has increased almost 16 percent; the number is about 11 percent in West Virginia. Further, for about a 15-year period (1982 to 1997), it has been estimated that North Carolina lost 1,001,000 acres (5.9 percent) of its total forest area to land conversion related to population growth and urbanization (North Carolina State University, 2016). Today approximately 32 million people reside in Virginia, West Virginia, North Carolina, and Pennsylvania.

Although the region has been substantially affected by human activity, natural resources remain. There are still large portions of the project area that are currently rural and not densely occupied. NWI data indicate that there are about 829,616 acres (FWS, 2016m) of wetlands in the HUC-10 watersheds crossed by ACP and SHP, and NLCD from the EPA indicates that there are about 4,334,392 acres of upland forest in these same HUC-10 watersheds (EPA, 2016c).

To understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. In this analysis, we generally consider the impacts of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline), which was described under the specific resources discussed throughout section 4. However, this analysis does include the present effects of past actions that are relevant and useful.

4.13.2 Projects within the Geographic Scope of Analysis

Table W-1 in appendix W identifies the specific other projects, activities, or actions within the geographic scope of influence for ACP and SHP. We identified these projects through scoping and independent research using desktop analysis of available aerial photography, files at the FERC, NFS data, information available on public websites, as well as internet searches for projects within the geographic limits identified above, and information provided by Atlantic and DETI. The approximate locations of the projects (those that could be identified through research) in relation to ACP and SHP are shown on figure W-1 in appendix W.

We identified eight types of projects that would potentially cause a cumulative impact when considered with the proposed projects. These are:

1. nonjurisdictional oil and gas exploration and production;
2. FERC-jurisdictional natural gas interstate transportation projects;
3. mining operations;
4. nonjurisdictional natural gas gathering systems;
5. transportation or road projects;
6. commercial/residential/industrial and other development projects;
7. power plants or electric transmission lines; and
8. projects planned on NFS lands.

Following a discussion of these projects is an analysis of the resource-specific cumulative impacts in section 4.13.3.

4.13.2.1 Oil and Gas Exploration and Production

Oil and gas wells are not under the jurisdiction of FERC; instead, these activities are regulated by individual states. Marcellus and Utica Shale production wells involve improvement or construction of roads, preparation of a well pad, drilling and completion of the well, and constructing compressor or pump stations and processing plants. We were able to estimate the amount of land that would be disturbed, but we do not know how many acres of that land are forest, wetland, or pasture. Similarly, data for resources affected by the existing wells are also unknown. As a result, it is only possible to speak in general terms about the cumulative effects on specific resources. It is likely that drilling would continue through the construction of the proposed ACP and SHP, but the exact extent of such drilling is unknown. Land requirements for construction and operation of well pads are significantly less when compared to ACP and SHP due to their discrete locations. The proposed projects are not reliant on other projects, such as new well pads and additional drilling, to meet Atlantic's and DETI's stated objectives.

Multiple intrastate natural gas well interconnections and gathering facilities (not jurisdictional to FERC) are either proposed, under construction, or have been constructed within the geographic scope of influence of the proposed ACP and SHP. These nonjurisdictional pipeline systems typically gather natural gas from Marcellus and Utica Shale wells for transport to local customers or the interstate natural gas transmission system. Construction of the gathering systems typically involves activities similar to construction of interstate natural gas transmission facilities, although land requirements for construction are usually less for gathering systems due to the installation of smaller diameter pipe and shorter pipeline distances.

4.13.2.2 FERC-jurisdictional Natural Gas Pipeline Projects

There are 11 planned, proposed, or existing FERC-jurisdictional natural gas transmission projects that have portions within the defined geographic scopes of influence of the proposed ACP and SHP (see table W-1 in appendix W). Several of these other projects are currently in our pre-filing environmental review process; some have already filed applications with FERC; some are under construction while others were recently constructed and are already operational. A summary of each project is included below, and additional details regarding each project can be obtained through our website at http://www.ferc.gov/ by utilizing the docket number given for each project.

- MVP Project: A proposed 301-mile-long, 42-inch-diameter natural gas pipeline system from northwestern West Virginia to southern Virginia. The MVP would be constructed and owned by Mountain Valley Pipeline, LLC, which is a joint venture of EQT Midstream Partners, LP; NextEra US Gas Assets, LLC; Con Edison Gas Midstream, LLC; WGL Midstream; Vega Midstream MVP LLC; and RGC Midstream, LLC. The MVP Project would provide up to 2 million Dth/d of firm transmission capacity to markets in the Mid- and South Atlantic regions of the United States. The MVP Project would extend the Equitrans transmission system in Wetzel County, West Virginia, to Transco Zone 5 Compressor Station 165 in Pittsylvania County, Virginia. In addition, the MVP Project would require three compressor stations, with identified locations in Wetzel, Braxton, and Fayette Counties, West Virginia. The FERC issued a draft EIS for the project on September 16, 2016. FERC Docket Nos. CP16-10 and CP16-13.

- Virginia Southside Expansion Project: This project was completed in 2015 and consisted of a 100-mile-long, 24-inch-diameter natural gas pipeline system extending from the

Transco mainline in Pittsylvania County, Virginia to Brunswick County, Virginia. The Virginia Southside Expansion Project is owned by Transco and provides 270,000 Dth/d of incremental transportation capacity to fuel new electric-power generation in Virginia and serve increasing local distribution demand in North Carolina. In addition, the project added horsepower to Transco's existing Station 165 in Pittsylvania County. FERC Docket No. CP13-30.

- Virginia Southside Expansion Project Phase II: A 4-mile-long, 24-inch-diameter natural gas pipeline system from the Transco Brunswick Lateral in Brunswick County, Virginia to Greensville County, Virginia. This project is owned by Transco and is currently under construction. The Virginia Southside Expansion Project Phase II will provide the 250,000 Dth/d of natural gas required to serve a new 1,580-megawatt, combined-cycle, natural gas-fired electric generation facility that Dominion Virginia Power is building in Greensville County. In addition, the Virginia Southside Expansion Project Phase II will require additional compression at stations in Pittsylvania and Prince William Counties, Virginia and one delivery M&R station in Greensville County. Construction of the project began in October 2016. FERC Docket No. CP15-118.

- WB XPress Project: About 29 miles of varying size new and replacement natural gas pipeline in West Virginia and Virginia. The WB XPress Project would be constructed and owned by Columbia. This project would provide an additional 1.3 million Dth/d of natural gas to meet growing market demands. In addition, the WB Xpress Project would include construction/installation of new and modified compressor stations. A special use application was submitted to the FS by Columbia on August 19, 2016 to allow construction and operation of the WB Xpress Project on NFS lands managed by the MNF. On March 24, 2017, FERC issued the Notice of Availability of the EA for the WB XPress Project. The comment period for the WB XPress Project ended April 24, 2017. Pending approval from the FERC and other permitting agencies, Columbia anticipates the project being placed into service in 2018. FERC Docket No. CP16-38.

- Rover Pipeline Project: A 713-mile-long, 24- to 42-inch-diameter natural gas pipeline system from southeastern Ohio to Livingston County, Michigan. The Rover Pipeline Project is owned by Rover Pipeline LLC and is currently under construction. This project will provide 3.25 Bcf/day of domestically produced natural gas to markets in the Midwest, Northeast, East Coast, Gulf Coast, and Canada. In addition, the project will require installation of seven compressor stations in Ohio, two compressor stations in West Virginia, and one compressor station in Pennsylvania. The FERC issued a final EIS for the Rover Pipeline Project in July 2016. The Commission issued an Order authorizing the project on February 2, 2017. Construction of the project began in March 2017. FERC Docket No. CP15-93.

- Clarington Project: The project was placed into service on November 1, 2016 and consists of additional compression at existing compressor stations in Marshall County, West Virginia and Monroe County, Ohio. The Clarington Project facilities are owned by DETI and provide 250,000 Dth/d of incremental firm transportation service to interconnects in Monroe County: one with Texas Eastern Transmission and one with Rockies Express Pipeline. In addition, the Clarington Project includes interconnecting piping and less than 1,000 feet of 16-inch-diameter pipeline to tap into the Rockies Express Pipeline. FERC Docket No. CP14-496.

- Monroe to Cornwell Project: The Monroe to Cornwell Project was placed into service on October 14, 2016. This project consists of a 5-mile-long, 24-inch-diameter natural gas pipeline from DETI's Cornwell Compressor Station in Kanawha County, West Virginia, to Columbia's existing line in Clay County, West Virginia. The Monroe to Cromwell Project facilities are owned by DETI and provide 205,000 Dth/d of firm transportation service for Columbia. In addition, the project included modifications to existing compressor stations in Wetzel and Kanawha Counties, West Virginia. FERC Docket Nos. CP15-7 and CP15-87.

- Texas Eastern Appalachia Market 2014 Project: This project was completed in 2014 and consisted of 33 miles of 36-inch-diameter natural gas pipeline loop in Fayette, Perry, Dauphin, Lebanon, and Berks Counties, Pennsylvania. The Texas Eastern Appalachia Market 2014 Project facilities are owned by Texas Eastern Transmission, LP and provides 600,000 Dth/d of additional incremental transportation service to markets in the Northeast, Midwest, Southeast, and Gulf Coast. In addition, this project included abandonment of compressor units at the Delmont Compressor Station; and additional compression at existing facilities in Fayette, Westmoreland, Indiana, and Huntingdon Counties, Pennsylvania. FERC Docket No. CP13-84.

- Mountaineer XPress Project: A proposed 170-mile-long, 24- to 36-inch-diameter natural gas pipeline system in West Virginia. The Mountaineer XPress Project would be constructed and owned by Columbia. This project would provide up to 2.7 Dth/d of natural gas for delivery to markets across Columbia's system, including the Columbia Gulf Leach interconnect with Columbia Gulf in Leach, Kentucky. In addition, the Mountaineer XPress Project would include installation of new or modifications of multiple aboveground existing facilities in West Virginia. The FERC issued a draft EIS for the project on February 27, 2017, and the final EIS is scheduled to be issued in late July 2017. FERC Docket No. CP16-357.

- Natrium to Market Project: This project was completed in 2014 and consisted of additional compression at an existing station and modifications to an existing M&R station in Greene County, Pennsylvania to transport natural gas from the Natrium Plant to markets in the Northeastern and Mid-Atlantic regions. The Natrium to Market Project facilities are owned by DETI and provide 185,000 Dth/d of firm transportation service to an interconnect between DETI and Texas Eastern Transmission, LP in Greene County, Pennsylvania. In addition, the project included modifications to an existing compressor station in Westmoreland County, Pennsylvania. FERC Docket No. CP13-13.

- Leach XPress Project and Rayne XPress Expansion Project: A 161-mile-long, 20- to 36-inch-diameter natural gas pipeline system through West Virginia, Pennsylvania, and Ohio. The Leach XPress Project is owned by Columbia, while the Rayne XPress Expansion Project is owned by Columbia Gulf Transmission, LLC; both are under construction. The Leach XPress Project will provide up to 1,500,000 Dth/d of natural gas and the Rayne XPress Expansion Project will provide up to 621,000 Dth/day of natural gas. In addition, these projects would include installation of new compressor and regulator stations, as well as modifications to existing compressor and regulator stations. The Commission issued an Order authorizing the projects on January 19, 2017. Construction of the projects began in February 2017. FERC Docket Nos. CP15-514 and CP15-539.

Table 4.13.2-1 lists the general environment impacts associated with each FERC-regulated project based on FERC-issued environmental documents (i.e., EIS or EA) or applicant-prepared reports provided as part of the application or pre-filing materials.

TABLE 4.13.2-1

Environmental Impacts Associated with FERC-Regulated Projects within the Geographic Scope of Influence [a]

Project Name	Impacts (acres) – *Soils, Vegetation, Land Use* Con.	Op.	Prime Farmland Impacts (acres)	Number of Waterbodies Crossed	Wetland Impacts (acres) Temp.	Perm.	Forest Impacts (acres) Temp.	Perm.	No. of Likely to Adversely Affect Species
MVP Project	6,524	2,179	3,005	361	39	15	4,856	1,717	3
Virginia Southside Expansion Project	1,454	119	703	288	52	5	483	89	1
Virginia Southside Expansion Project II	180	29	55	15	1	<1	30	12	0
Rover Pipeline Project	9,996	3,422	5,901	864	160	71	3,034	1,183	0
Clarington Project	40	12	0	2	0	0	6	0	0
Monroe to Cornwell Project	46	2	NA	6	<0.1	<0.1	74	27	0
Texas Eastern Appalachia Market 2014 Project	812	99	560	140	10	10	115	27	0
Mountaineer XPress Project	3,659	1,064	420	829	6	<1	129	76	9
Natrium to Market Project	42	4	22	0	0	0	0	0	0
Leach XPress Project and Rayne XPress Expansion Project	3,194	1,007	575	1,083	16	1	1,381	516	0
WB XPress Project	614	282	61	95	8	<1	140	40	0

[a] Quantitative data are approximate and based on information presented in a FERC-issued EIS or EA, or the most current applicant-provided information.

[b] NA = not available

Of the reasonably foreseeable future projects, the MVP Project, Virginia Southside Expansion and Expansion Project II, and WB XPress Project would be the closest to ACP, with each being 1 mile or less from proposed ACP facilities. The MVP Project, Rover Pipeline Project, Clarington Project, Monroe to Cornwell Project, and Mountaineer XPress Project would be the closest projects to SHP, with each being 1 mile or less from proposed SHP facilities. These projects have proposed or active schedules that would likely overlap with ACP and SHP.

All the FERC-jurisdictional projects would be constructed and maintained in accordance with general measures that would be similar to those that are described throughout section 4 of this EIS; our additional recommended mitigation measures for each project, as applicable; and other construction, operation, and mitigation measures that may be required by federal, state, or local permitting authorities, further reducing the potential for cumulative impacts.

4.13.2.3 Mining Operations

Information regarding mineral resources in West Virginia and Virginia were obtained though the West Virginia GIS Technical Center (WVDEP, Undated (a and b) and 1996), the VDMME (2015), and the USGS (2015). Mineral resources identified near ACP and SHP include non-fuel mineral resources consisting of clay, sand, gravel, and limestone, as well as fuel mineral resources including coal, oil, and natural gas. Although not listed individually in table W-1 in appendix W due to their extensive nature, there are several active surface mining operations within the defined geographic scope of influence for various resources. Operating these facilities requires surface clearing and mineral extraction. These activities could occur into the foreseeable future. These activities are also regulated by state and local authorities.

There is a long history of coal mining operations in the project areas since the 1800s. Mining operations in West Virginia consist mainly of coal mines; mines in Virginia consist of clay, sand and gravel, limestone, iron, and nickel; and mines in North Carolina consist mainly of sand and gravel, crushed stone, lithium minerals, and gemstones. Mines within the ACP and SHP project areas are discussed in section 4.1.3 and in section 4.13.3.1. ACP and SHP are in the Appalachian coal-producing region and at present there are over 3,800 acres of land occupied by coal mining operations in West Virginia and Virginia. Coal extraction within the project areas requires land to be disturbed, through surface strip mining (including mountaintop mining) and underground operations (including long wall mining) which can result in impacts on water, vegetation, soils, geology, and other resources, and can result in soil erosion, dust, and noise pollution. Depending on the mine operator (and the underlying resources present), we expect future clearing and excavation to occur incrementally.

4.13.2.4 Nonjurisdictional Project-related Facilities

Atlantic and DETI have identified associated facilities that do not fall under the jurisdiction of the Commission but are integral to the need for a project and/or are minor components that would be built as a result of the jurisdictional facilities (see section 2.8). Table W-1 in appendix W lists the nonjurisdictional project-related facilities associated with ACP and SHP.

4.13.2.5 Other Projects and Actions

Table W-1 in appendix W lists the past, present, and reasonably foreseeable residential developments; commercial, industrial, and municipal developments; transportation projects; electric generation and transmission projects; and NFS projects in the defined geographic scope of influence identified for ACP and SHP. In general, many of these projects would consist of short-term, localized activities, except those that involve permanent facilities or tree removal. We anticipate that these residential development projects would require state or local approval and that BMPs would be implemented to minimize environmental impacts such as erosion and sedimentation.

Planned residential developments within 0.25 mile of ACP and SHP are discussed in section 4.8.4 and listed in table 4.8.4-1. In addition, two additional past, present, or reasonably foreseeable developments were identified within the defined geographic scope of influence:

- City of Suffolk, Virginia, Planter's Station. Planned residential development about 0.4 mile south of AP-3 lateral MP 63.1. ACP would not directly affect the development.

- City of Suffolk, Virginia, Bridlewood Estates. Recently constructed residential development about 0.1 mile south of AP-3 lateral MP 65.8. ACP would not directly affect existing homes within the development.

Erecting permanent residential and other aboveground structures and facilities would result in the permanent loss of vegetation and associated wildlife habitat; displacement of wildlife; loss of soil and land use; alteration of surface and groundwater flow and aesthetic characteristics; and could temporarily and/or permanently increase dust, and impact noise levels and air quality.

Due to the speculative nature of the housing and development markets and funding mechanisms for other projects listed in table W-1 in appendix W, it is difficult to determine the amount of land that would ultimately be affected by these projects and, therefore, contribute to a cumulative impact with ACP and SHP. Based on the permanent nature of impacts related to housing developments and similar actions, and the largely temporary impacts associated with ACP and SHP, we have determined that adding the assumed impacts of the other projects to the known (or reasonably estimated) impacts of ACP and SHP would not result in a significant cumulative impact on any of the resources affected by ACP and SHP.

Regarding transportation projects, the Virginia, West Virginia, North Carolina, and Pennsylvania Departments of Transportation are overseeing multiple ongoing and proposed infrastructure projects in the geographic scope of influence for ACP and SHP. The scope of work for most of the projects are limited to work on existing infrastructure. We did not identify any major new federal highway or road projects sponsored by the DOT. Of the transportation projects with multiple locations, those that are in counties crossed by ACP and SHP were evaluated according to the geographic scope guidelines and criteria established for this cumulative analysis. We also received comments from the VDOT regarding several planned roadway projects that would intersect or be near ACP (VDOT, 2017). These include repaving and treatment jobs along local routes. The timeframe in which these projects would occur is unknown. We acknowledge that construction of ACP when combined with the projects identified by the VDOT could have a cumulative effect, but, absent defined construction schedules, the degree and timing of impacts are speculative. Regardless, Atlantic would be required to obtain the necessary permits from the VDOT to cross these areas, coordinate traffic management, and comply with any permit stipulations.

As also listed in table W-1 in appendix W, many activities are proposed on the MNF and GWNF. These include forest-wide activities that assist with management of the respective forest and its habitat (e.g., vegetation thinning, prescribed fire), extension of existing authorizations, and fiber optic projects. These activities have been determined to be a categorical exclusion to NEPA by the FS or are undergoing a NEPA review (e.g., EA) by the FS. While the resource discussions below consider FS projects, it is assumed that for projects where a categorical exclusion has been applied, they would not result in significant impacts, and that for projects where an EA is being developed, the FS would also consider the cumulative effects of the proposed action and require mitigation as necessary to promote conformance with FS management objectives and standards.

4.13.3 Potential Cumulative Impacts of the Proposed Action on Resources

The potential impacts that we consider as part of our cumulative review pertain to geology and soils; groundwater, surface water, and wetlands; vegetation; wildlife; fisheries and aquatic resources; land use, special interest areas, and visual resources; socioeconomics; cultural resources; air quality (including climate change); and noise. The defined geographic scope of influence for each resource is listed in table 4.13-1.

4.13.3.1 Geology

There are two ways that ACP and SHP, in addition to other projects in the geographic scope of influence, may have cumulative impacts on geological resources: (1) they may affect existing mineral resources, such as mines, quarries, or oil and gas wells; or (2) they may be subject to natural geological hazards.

A total of 14 active and 4 inactive or abandoned oil and gas wells, and 9 reclaimed surface mines are known to be present within the proposed ACP workspace, and 3 active mineral resource facilities were identified within 0.25 mile of ACP; however, no active wells or mineral resource facilities would be crossed by ACP or SHP. In addition, ACP would cross 26 coal mines in West Virginia where mine status is identified as abandoned, permit revoked, closed-released, or not started. Atlantic has also identified 15 non-fuel mineral mines (manganese, limestone, clay, shale, and sand and gravel) that are within 0.25 mile of ACP.

The pipeline could potentially interfere with future mining and reclamation activities on lands adjacent to the right-of-way and cumulatively contribute to limiting the future expansion of surface mines or the development of new mineral resources lands adjacent to the right-of-way.

Given the project area, it is likely that the other projects listed in table W-1 in appendix W would cross areas with karst geology and similar geological hazards. The occurrence of karst geology is an important consideration for ACP and SHP, specifically between AP-1 MPs 59 to 75, AP-1 MPs 80 to 109, and AP-1 MPs 122 to 158. Atlantic developed its *Karst Mitigation Plan* to identify construction monitoring protocols and mitigation and conservation procedures for karst geology. In addition, Atlantic would implement its BIC Team and SAIPR to plan for construction through geological hazards. Timber harvests, new road construction, and other developments proposed by other projects in the area have the potential to adversely affect slope stability. Projects on federal lands would use BMPs and design standards applicable to the site conditions and would avoid unstable areas.

Blasting operations associated with ACP and SHP would be conducted in accordance with Atlantic's and DETI's *Blasting Plan* as well as applicable state blasting codes and any local blasting requirements. All blasting activity would be performed by state-licensed professionals according to strict guidelines designed to control energy release. Proper safeguards would be taken to protect personnel and property in the area. Other projects within the geographic scope of ACP and SHP would be subject to state and local permitting requirements that are intended to reduce or mitigate for the impacts associated with blasting. Therefore, we do not anticipate any significant cumulative effects as a result of blasting in the area.

Based on the mitigation plans and measures that would be implemented, ACP and SHP, in conjunction with the foreseeable projects listed in table W-1 in appendix W, are not expected to contribute significantly to cumulative impacts related to geologic hazards, including sinkholes (karst), landslides, and fault movements.

4.13.3.2 Soils and Sediments

Cumulative impacts on soils and sediments include erosion and compaction resulting from ACP and SHP and other projects in the defined geographic scope for this resource. Construction of ACP and SHP would disturb about 3,938 acres and 68 acres, respectively, of prime farmland soils. A review of available data for the FERC-jurisdictional projects listed in table W-1 in appendix W shows that an estimated 11,300 acres of prime farmland would be affected by the projects that intersect the defined geographic scope of influence of ACP and SHP. While quantitative data for total prime farmland soils within the HUC-10 watersheds was not available, we consider these impact acreages to be relatively small overall and unlikely to contribute to cumulative impacts, particularly considering that most soils would be returned following construction.

Any increase in land clearing and soil disturbance due to construction activities may potentially contribute to cumulative impacts on soils and sediment. To reduce impacts on soils, and curtail erosion, Atlantic and DETI would follow the measures outlined in the FERC *Plan* and *Procedures* and their construction and restoration plans (see table 2.3.1-1), which include installation of erosion control devices, topsoil, soil decompaction, and revegetation. Implementation of these plans and the measures discussed in section 4.2 would minimize incremental impacts on soils. Other federal projects would also employ BMPs limiting effects on soil and sediment. FS LRMPs include specific standards designed to avoid detrimental soil impacts and sediment delivery to streams. These standards are designed for the specific site conditions found in each prescription area. While the combined projects would result in an increase in erosion, given the erosion control BMPs and restoration on federal lands, we conclude that ACP and SHP, when added to other the projects within the geographic scope of influence, would not result in significant cumulative effects on soils.

4.13.3.3 Water Resources

Construction and operation of ACP and SHP would result in short-term impacts on water resources (see section 4.3). Direct and indirect impacts, such as increased turbidity, change in water temperature, and potential changes in water quality at the crossing location should return to baseline levels over a period of days or weeks following construction or when restoration efforts have been permanently established. Longer term impacts, such as erosion and sediment transport to waterbodies from the adjacent construction right-of-way and access roads, and restoration of riparian vegetation could also occur as the right-of-way is stabilized over time. Changes in surface runoff, infiltration rates, and trench drainage could occur over the life of the project.

Water availability, use, and the regulations that are put in place to protect these resources varies from state to state. For example, according to the WVDEP, an estimated 42 billion gallons of water are available per day in its rivers and streams. Large quantity users (excluding hydro-electric) withdraw approximately 978 billion gallons per year, of which only 59 billion gallons are consumed per year (WVDEP, 2015). In West Virginia, the Hydrostatic Testing General Permit, WV0113069, provides coverage for any establishment with discharges composed entirely of waters from hydrostatic testing of new pipeline and agreeing to be regulated under the terms of the General Permit. For this general permit, the term “establishment” means certain pipeline replacement and/or construction projects.

In West Virginia, Groundwater Protection Plans are required for all facilities having the potential to impact groundwater. They are “preventive maintenance” documents that cover all processes and materials at a facility that “may reasonably be expected” to have an effect on groundwater quality. The facility must make an inventory of all potentially contaminating processes and materials, and have structures and practices in place to prevent groundwater contamination from these processes and materials. Groundwater protection practices include, at a minimum, quarterly inspections and maintenance by facility personnel and usually include spill cleanup procedures. In addition, any wastewater generated during exploratory and/or developmental drilling, well treatment operations, plugging operations, and reworking of wells is regulated under General Permit GP-WV-1-88. This process is overseen by the WVDEP Office of Oil and Gas.

According to the VDEQ, total 2014 water withdrawals were approximately 17 million gallons per day (1.4 percent) greater than those reported for 2013, increasing from 1,202 million gallons per day in 2013 to 1,219 million gallons per day in 2014. This includes agricultural, commercial, irrigation, manufacturing, mining, public water supply, and other uses. The year-to-year changes in withdrawals represented by the two largest categories (Public Water Supply and Manufacturing) have been less than 3 percent of the previous year’s total. As a result of these changes, the reported 2014 total withdrawals are within approximately 2 percent of the average for the 5-year period (VDEQ, 2015b).

In Virginia, general permit VAG83 governs the discharge of wastewaters from sites contaminated by petroleum products, chlorinated hydrocarbon solvents, the hydrostatic testing of petroleum and natural gas storage tanks and pipelines, and the hydrostatic testing of water storage tanks and pipelines. These wastewaters may be discharged from the following activities: excavation dewatering, conducting aquifer tests to characterize site conditions, pumping contaminated groundwater to remove free product from the ground, discharges resulting from another petroleum product or chlorinated hydrocarbon solvent cleanup activity approved by the board, hydrostatic tests of natural gas and petroleum storage tanks or pipelines, hydrostatic tests of underground and aboveground storage tanks, and hydrostatic tests of water storage tanks and pipelines.

The VDEQ requires permits related to surface water and groundwater withdrawals and discharges including the Virginia Water Protection General Permit Number WP2 for facilities and activities of utilities regulated by the Commonwealth Corporation Commission. The permit program governs permanent and temporary impacts related to the construction and maintenance of utility lines.

In NCAC Title 15A, Subchapter 2L, Sections .0100, .02300, and .0300 establishes criteria for groundwater classification, groundwater quality standards, and Interim Maximum Allowable Concentrations of contaminants in groundwater. High-capacity groundwater withdrawals are regulated through permitting requirements for the construction of any water supply wells and water well system with a design capacity equal to or greater than 100,000 gallons per day. Additionally, registration is required for any non-agricultural water use in excess of 100,000 gallons or more of groundwater or surface water in any one day, or the transfer of 100,000 gallons or more in any one day of surface water from one river basin to another. NCAC Title 15A, Subchapter 2B establishes standards for surface waters and wetlands, including an antidegradation policy to protect the existing uses of surface waters through NPDES permitting requirements for discharge of wastewater to surface waters.

Groundwater

Section 4.3.1 describes the presence of water wells and springs near the projects. The ACP and SHP routes would cross near numerous wells and springs, some of which would be within 0.1 mile of ACP and SHP. Given the relatively shallow (typically less than about 8 feet) nature of pipeline trenching and the often deep depths at which water wells are drilled to reach aquifers, it is generally unlikely that pipeline activities would negatively affect groundwater supplies from wells, although springs may be more subject to disruption. Potential impacts on groundwater in karst areas may be more likely given the extensive interaction between surface and near surface flow and deeper aquifers. As described in section 4.3.1, Atlantic and DETI have introduced measures to reduce the potential to impact karst features and groundwater resources.

As is the case with ACP and SHP, most other types of projects listed in table W-1 in appendix W would have a similar, limited ability to significantly affect groundwater resources, except for oil and gas well exploration and production. For example, sources estimate that about 4.4 million gallons of water is typically used for a single hydraulically fractured well in Pennsylvania (Washington and Jefferson College, 2014). If a total of 3,638 unconventional wells were permitted or completed within the geographic scope of influence in Pennsylvania and West Virginia in 2013, construction of the wells could have used about 16 billion gallons of water. Approximately 1.9 million gallons of water per day is used for Marcellus Shale development in Pennsylvania, or about 0.02 percent of the 9.5 billion gallons of water withdrawn in Pennsylvania (from surface or groundwater sources) per day for all general uses and consumption (Governor's Marcellus Shale Advisory Committee, 2011). This water may be obtained from either groundwater or surface water sources, trucked to the wells, or transported in fresh water pipelines.

In West Virginia, approximately 5 million gallons of fluid are injected per fractured well. Reused flowback fluid accounts for approximately 8 percent of water used in hydraulic fracturing. On average 8 percent of injected fluid is recaptured. The remaining 92 percent remains underground and removed from the hydrologic cycle for the duration of the activity (Hansen et al., 2013).

Given the nature of shallow pipeline trenching relative to deeper aquifers, Atlantic's and DETI's *Karst Mitigation Plan*, as well as the protective permitting requirements of other agencies for other projects such as oil and gas well development, we conclude that the combined cumulative effects upon groundwater would be less than significant.

Surface Waters

The ACP pipeline would cross 514 perennial waterbodies and the SHP pipeline would cross 56 perennial waterbodies. Atlantic would cross major waterbodies using HDD or cofferdam methods; no major waterbodies are crossed by SHP. Atlantic would use the dry crossing method at 940 of the 1,242 pipeline crossing locations, and the dry crossing method would be used at all SHP waterbody crossings. The open-cut method would be used at 91 waterbody crossings on ACP, and would be completed within the time limits (typically within 24 to 28 hours) prescribed by the *FERC Procedures* to limit the impacts to the stream. Additional protective measures outlined in the FERC *Procedures*, such as fueling buffer restrictions, maintenance of flow rates, and stream and riparian area restoration, would further limit the potential for impacts on waterbodies associated with the FERC-regulated projects. The other FERC-regulated projects would cross multiple waterbodies, as listed in table W-1 in appendix W within the HUC-10 watersheds comprising the geographic scope of influence. Examples of shared waterbody crossings between the projects include the Blackwater River (ACP, MVP), Greenbrier River and its branches (ACP, MVP), Laurel Run (ACP, MVP, Texas Eastern Appalachia Market 2014 Project), Roanoke River and its tributaries (ACP, MVP), and Stony Creek (ACP, MVP, Rover, Texas Eastern Appalachia Market 2014 Project). Due to their proximity, the greatest overlap in waterbody crossings would be between ACP, SHP, and MVP.

As discussed previously, impacts associated with ACP and SHP account for about 0.1 percent of these watersheds, while other projects within the same watersheds account for about 0.4 percent of the same watersheds. Construction of ACP and SHP would result in temporary or short-term impacts on surface water resources (see section 4.3.2), as well as some minor long-term impacts such as loss of forested cover in the watershed and partial loss of riparian vegetation. Given Atlantic's and DETI's commitment to restore waterbodies according to specifications based on the FERC *Procedures*, direct and indirect impacts, such as increased sediment transport to waterbodies and turbidity levels, are expected to return to baseline levels following construction and restoration efforts at each crossing. In the longer term, steep slopes adjacent to stream crossings would continue to be vulnerable to heavy precipitation events and slope instability. Continuous maintenance of erosion control structures until the affected areas have been stabilized would minimize sediment transport and long-term impacts on water resources.

The projects listed in table W-1 in appendix W are within watersheds crossed by ACP and SHP routes, and some of these other projects may result in impacts on surface waters. Thus, potential cumulative impacts could result if the proposed projects are constructed at the same time as other projects listed in table W-1 in appendix W. However, ACP and SHP would contribute little to the long-term cumulative impacts on waterbodies given most of the potential impacts from the construction of ACP and SHP are temporary and short-term. Impacts from installation of the pipeline at the crossing location to surface waters would end shortly after pipeline installation. ACP and SHP would, for the most part, cross waterbodies with dry crossing methods following the FERC *Procedures*, including erosion controls to prevent sedimentation and elevated turbidity. Increased sedimentation and turbidity resulting from potential run-off from the adjacent construction workspace and use of access roads would be mitigated through implementation of erosion control measures at the edges of the workspace and access roads within 300 feet of ESA sensitive waterbodies, at access roads with high erosion potential, and there are slope instability concerns. Atlantic and DETI would also implement state-specific erosion and sediment control measures, and develop and implement project-specific SWPPPs. Also, other energy projects, transportation projects, residential projects, FERC nonjurisdictional pipeline projects, etc. would likely be required to install and maintain BMPs similar to those proposed by ACP and SHP as identified by federal, state, and local permitting requirements to minimize impacts on waterbodies. Any projects crossing Waters of the United States would have to obtain permits from the USACE. Therefore, most of the impacts on waterbodies are expected to also be of short duration and/or permittable under regulations implemented by the USACE. Consequently, the cumulative effect on surface waterbody resources would be temporary and minor.

Wetlands

Construction and operation of ACP would temporarily and permanently impact 795.4 and 243.0 acres of wetland, respectively. Construction and operation of SHP would temporarily and permanently impact 2.8 and 0.9 acres of wetland, respectively. During operation of the projects, emergent and scrub-shrub wetlands would be returned to their preconstruction condition, use, and function. However, about 227 acres of forested wetlands would be converted to emergent and scrub-shrub conditions, representing a permanent impact on wetland function. Atlantic and DETI submitted applications to the USACE for unavoidable wetland impacts for ACP and SHP, and wetland and stream credits would be purchased from approved mitigation banks in the respective states.

Other FERC-regulated projects within the geographic scope of influence of ACP and SHP would permanently affect an estimated total of about 102 acres of wetlands, as listed in table W-1 in appendix W. We were unable to find quantitative data for the extent of impacts to wetlands from non-FERC regulated projects, but we assume that some level of impacts would occur and that mitigation would be required by the USACE or states for projects requiring authorization from the agency.

Given the purchase of wetland and waterbody credits from the USACE and the relatively small total of wetland acres affected by the combination of ACP and SHP, as well as the other projects listed in table W-1 in appendix W, we conclude that cumulative impacts on wetlands within the HUC-10 watersheds, when considered with the projects identified in this analysis, would not be significant.

4.13.3.4 Vegetation

Vegetation would be cleared from the right-of-way during construction and then restored during operations of ACP and SHP, except for at aboveground facilities and new permanent access roads and in forested areas along the permanent right-of-way, as discussed in section 4.4. Construction of ACP would impact about 6,875 acres of vegetation; construction of the SHP pipeline would impact about 634 acres of vegetation. During operation of ACP and SHP, the a 10-foot-wide strip centered on the pipeline within the permanent right-of-way would be maintained in an herbaceous state, and trees within 15 feet of the pipeline would be removed, resulting in a permanent loss of approximately 1,389 acres of deciduous forest, 200 acres of coniferous forest, 1,156 acres of mixed forest, and 393 acres of woody wetland (see table 4.4.3-1).

Oil and gas development and nonjurisdictional project-related facilities would also result in cumulative impacts on vegetation. While the vegetation impacts of these projects and ACP and SHP would not be inconsequential, we consider the overall impact of all projects minor in comparison to the abundance of comparable habitat in the area. For example, based on NLCD from the EPA, there are about 4,334,392 acres of upland forest in the shared HUC-10 watershed within the geographic scope of influence (EPA, 2016c). Atlantic and DETI would be required to restore vegetation in temporarily disturbed areas, and we expect that nonjurisdictional project-related facilities would be held to similar standards by state permitting agencies (where permits apply). As such, we assume that virtually all this disturbance would affect vegetation at least temporarily.

Oil and gas development, transportation projects, residential development projects, and nonjurisdictional project-related facilities would also likely be required to implement mitigation measures designed to minimize the potential for long-term erosion and resource loss, increase the stability of site conditions, and revegetate disturbed soils, thereby minimizing the degree and duration of the impacts of these projects.

The development of ACP and SHP and other projects in the area would result in habitat fragmentation due to vegetation removal. Fragmentation of forested habitat would make the right-of-way permanently unsuitable for interior forest species, and would create approximately 30,000 acres of additional forest edge susceptible to edge effects, which may include change in microclimate factors, spread of invasive plant species, increased avian predation, and creation of wildlife movement barriers. Some species, such as white-tailed deer and some predator species, may benefit from the creation of an open corridor.

Cumulative effects on vegetation disturbed by the projects would be limited primarily to the combined impacts of construction projects within the same geographic scope of influence as ACP and SHP and would be greatest where forested areas are removed for the permanent rights-of-way and facility footprints. While the vegetation impacts of these projects and ACP and SHP would not be inconsequential, the overall impact of these projects would be considered minor to moderate in comparison to the abundance of comparable habitat in the area. Existing roads, trails, agricultural practices, forest harvesting, and other infrastructure in the geographic scope of influence are also contributing to fragmentation. New or modified roads associated with new projects would also result in increased fragmentation. In areas where the proposed pipelines would be installed adjacent to existing maintained rights-of-way, the impact would be incremental to what is already experienced. Constructing and operating the projects adjacent to existing rights-of-way would minimize the areas of previously undisturbed vegetation that would be affected and reduce additional cumulative impacts on vegetation communities and wildlife habitats. The geographic extent and duration of disturbances caused by construction of ACP and SHP would be minimal and further minimized by the implementation of ACP's and SHP's construction and restoration plans (see section 2.3.1.1) and site-specific crossing plans prepared in consultation with the FERC and other agencies.

Cumulative impacts on vegetation resulting from nearby projects considered along with ACP and SHP are expected to be minor to moderate, considering the limited area affected within the geographic scope of influence; the large amount of undisturbed vegetation, including forests, remaining in each watershed (see table W-1 in appendix W); and the assumption that the other projects are expected to take the required precautions and mitigation measures in accordance with federal and state regulations and permitting.

4.13.3.5 Wildlife

We consider that vegetation, as discussed above in section 4.13.3.4, is a generalized proxy for wildlife habitat. Construction activities such as right-of-way and ATWS clearing and grading would result in a loss of vegetation cover and soil disturbance, alteration of wildlife habitat, displacement of wildlife species from the construction zone and adjacent areas, mortality of less mobile species or species with specific habitat requirements, and other potential indirect effects as a result of noise created by construction and human activity in the area. Overall impacts would be greatest where projects are constructed in the same timeframe and area as ACP and SHP or that have long-term or permanent impacts on the same or similar habitat types. The overall footprint of ACP and SHP, in combination with the other identified projects within the defined geographic scope of influence, would result in the disturbance of thousands of acres of wildlife habitat including forested habitat that would either recover over the long-term in temporary workspaces or would be converted to herbaceous or shrub-scrub habitat in the permanent right-of-way. Construction and restoration activities associated with ACP and SHP may result in limited mortality of individuals for less mobile wildlife species unable to move out of the way of equipment. More mobile species are expected to relocate to similar adjacent habitat during construction and restoration. However, there are over 8.2 million acres of land area, much of which provides habitat for wildlife, within the HUC-

10 watersheds comprising the geographic scope of influence. While herbaceous vegetation and adjacent edge areas do provide habitat for numerous wildlife species more suited to human-caused modifications, this different suite of species would utilize the habitats converted from forested areas that formerly may have been inhabited by certain forest dwelling migratory bird species, for example. Impacts on habitat of wildlife species with limited mobility and home ranges could result in population-level effects to certain species, such as from impacts on vernal pools and rocky outcrops.

In general, wildlife is expected to return to affected areas following construction of ACP and SHP and other projects in the area. Clearing and grading of the construction rights-of-way for ACP and SHP and other nearby projects would result in loss and fragmentation of wildlife habitat. The effect of workspace clearing on forest-dwelling wildlife species would be greater than on open habitat wildlife species since forested lands could take decades to return to preconstruction condition in areas used for temporary workspace, and would be permanently prevented from re-establishing on the permanent right-of-way. This may result in the cumulative loss of individuals of small mammal species, amphibians, reptiles, nesting birds, and non-mobile species. Once the areas temporarily affected are restored, some wildlife displaced during construction of any of the projects would return to the newly disturbed area and adjacent, undisturbed habitats after completion of construction. Construction and operation of the associated compressor stations and new permanent access roads would result in some permanent impacts on wildlife habitat; however, due to the prevalence of similar habitats in adjacent areas, the permanent conversion of forested lands would not be a significant impact on wildlife resources within the proposed project area.

In addition, Atlantic has the potential to adversely affect subterranean habitats, such as karst and cave habitats, through disturbance and increased sedimentation. Although construction impacts on this habitat would likely be short-term, due to the sensitivity of the species that occupy these habitats, and because these species are often endemic to only a few known locations, even short-term changes to hydrologic patterns or water quality could have population-level effects. Additional discussions on subterranean habitat and the species associated with this habitat type are provided in section 4.7 and appendices R and S.

Based on U.S. Department of Interior determinations for similar projects, construction of the new communication towers associated with ACP and electric transmission projects could result in injury or mortality to migratory bird species protected by the MBTA and BGEPA. Construction and operation of any oil and gas development projects would also result in some permanent loss of wildlife habitat due to aboveground structures and well pads.

The other projects in the geographic scope of influence would presumably be required to restore areas disturbed by construction, thereby adequately minimizing some permanent impacts on wildlife and wildlife habitat. Road and other commercial projects, which convert the current habitat to a commercial/industrial use, would result in a permanent impact on wildlife and wildlife habitat. In addition, the spread of noxious weeds could affect wildlife habitat. However, over the long term the potential for habitat fragmentation and the spread of noxious weeds resulting from ACP and SHP would be reduced through implementation of Atlantic's and DETI's restoration measures. Similarly, mitigation measures implemented by the projects listed in table W-1 in appendix W would also be expected to reduce potential impacts associated with habitat fragmentation and the spread of noxious weeds.

Given the large amount of wildlife habitat that would remain undisturbed within the geographic scope of influence, the measures that Atlantic and DETI would use to minimize impacts associated with vegetation and habitat removal and re-establish the right-of-way, and the requirements for restoration for other projects, we conclude that ACP and SHP, combined with the other identified projects, would not have a significant cumulative impact on wildlife.

4.13.3.6 Fisheries and Aquatic Resources

As noted above in the discussion for surface water, ACP and SHP, as well as the other FERC-regulated and other projects, would affect numerous waterbodies that provide habitat for fish, mussels, and other aquatic organisms within the geographic scope of influence.

Cumulative impacts on fisheries and aquatic resources could occur if other projects take place within the same segment of a waterbody and have similar construction timeframes as ACP and SHP or that could result in permanent or long-term impacts on the same or similar habitat types. If constructed on the same waterbody in a similar timeframe, construction and operation of the projects identified in table W-1 in appendix W could result in cumulative impacts on waterbodies and fisheries from sedimentation and turbidity, habitat alteration, streambank erosion, fuel and chemical spills, water depletions, entrainment or entrapment due to water withdrawals or construction crossing operations, and blasting. We expect that most of the projects in the geographic scope of influence would be designed to minimize impacts on waterbodies, and thus on fisheries and aquatic resources, as much as possible. Any waterbodies that could not be avoided would be mitigated through implementation of BMPs and restoration practices in accordance with the respective federal, state, and local permitting agencies. Further, we expect that the WVDNR, VDGIF, NCWRC, and PAFBC would require any other applicable projects constructed in the geographic scope to adhere to state-mandated or recommended TOYR for construction within waterbodies containing sensitive fish and mussel species. However, we recognize that some of the projects identified in table W-1 in appendix W would affect the same species. For example, the candy darter would be affected by both ACP and MVP.

Impacts on aquatic resources would be temporary to long-term. Long-term impacts related to slope instability adjacent to streams have the potential to adversely impact water quality and stream channel geometry, and therefore downstream aquatic biota. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted. Atlantic and DETI would reduce construction impacts through implementation of the state-specific mussel and aquatic species relocation plans, and the FERC *Plan* and *Procedures*, in addition to adherence to agency-recommended TOYR, so that none of these impacts are expected to be cumulatively significant. The ensuing operations of the proposed ACP and SHP could result in cumulative impacts if maintenance activities take place in or near streams at the same time/location as other (non-related) project work.

4.13.3.7 Special Status Species

Cumulative effects on federally and state/commonwealth listed or sensitive wildlife and aquatic species are most likely to occur where projects would result in permanent or long-term loss of habitat types important to wildlife. Project types include oil and gas development, transportation projects, residential development projects, and nonjurisdictional project-related facilities listed in table W-1 in appendix W. Construction activities such as right-of-way and other workspace clearing and grading would result in loss of vegetation cover and soil disturbance, alteration of wildlife habitat, displacement of wildlife species from the construction zone and adjacent areas, mortality of less mobile species, and other potential indirect effects as a result of noise created by construction and human activity in the area. Overall impacts would be greatest where projects are constructed in the same timeframe and area as ACP and SHP or that have long-term or permanent impacts on the same or similar habitat types.

ACP and SHP may affect 21 ESA-listed threatened or endangered species, 1 proposed species, and 1 proposed critical habitat. Seven of these species are likely to be adversely affected by ACP and/or SHP. In addition, there are 6 species currently under review by the FWS for listing under the ESA in the ACP and SHP project areas. The FERC staff has developed this EIS (largely section 4.7.1) as our BA to enter formal consultation with the FWS. The FWS will produce a Biological Opinion on whether any ESA-listed or proposed species would be adversely affected or placed in jeopardy because of the projects, or if the projects would result in the destruction or adverse modification to critical habitat. The Biological Opinion would consider potential cumulative effects on the species its final determinations.

There are nine ESA-listed threatened or endangered species that are known or have the potential to occur in the MNF. and 10 ESA-listed threatened or endangered species on the GWNF. In addition, there is one proposed ESA species and one under review species that have the potential to occur on the GWNF. It is important to note that the FS issues its ROD only after completion of a Biological Opinion from the FWS.

Both the MNF and GWNF also maintain a list of RFSS and MIS, and the GWNF maintains a list of locally rare species (i.e., species that may be secure throughout their range, but are considered rare within the boundaries of the GWNF). RFSS species found within the MNF and GWNF are identified in tables R-1 and R-2, respectively, in appendix R. MIS species found in both the MNF and GWNF are identified in table R-3, and the GWNF list of locally rare species are described in table R-4, both found in appendix R. Due to pending survey results, pending conservation measures, and consultations with the MNF, GWNF, and other appropriate federal and state agencies detailed above, the FS' determination regarding the overall impacts on FS-managed species is pending and will be reflected in the FS' Final ROD.

ACP and SHP also have the potential to impact several state-listed or sensitive species. West Virginia does not have state threatened or endangered species legislation, but assigns State Ranks to rare species. Atlantic and DETI are currently working with the WVDNR to identify conservation measures for these species. An evaluation of species that have the potential to be affected in West Virginia is provided in section 4.7.4 and table S-1 of appendix S.

The Virginia Endangered Species Act designates the VDGIF as the agency responsible for managing Commonwealth fish and wildlife species, and the VDCR as managing Commonwealth plant and insect species. Atlantic and DETI are currently working with the VDGIF and VDCR to identify conservation measures for these species. An evaluation of species that have the potential to be affected in Virginia is provided in section 4.7.4 and table S-2 of appendix S.

In North Carolina, the NCWRC is responsible for managing fish and wildlife listed and special concern species, and the NCDNCR is responsible for managing plant and insect species. Atlantic and DETI are currently working with the NCWRC and NCDEQ to identify conservation measures for these species. An evaluation of species that have the potential to be affected in North Carolina is provided in section 4.7.4 and table S-3 of appendix S.

Table 4.13.2-1 lists the number of species that may be adversely affected by the other FERC-regulated projects within the geographic scope of influence of ACP and SHP.

The species discussed in section 4.7 of this EIS could potentially be affected by construction and operation of other projects within the same geographic scope of influence of ACP and SHP. Atlantic, DETI, and all other companies' projects are required by law to coordinate with the FWS, which will consider regional activity and changing baseline conditions when determining the extent of impacts on a ESA-listed or proposed species. Non-federal projects are also required to adhere to the ESA, although the FWS has a different mechanism for evaluation and minimizing impacts. Protection of threatened, endangered, and other special status species is part of the various state permitting processes or resource reviews. As such, cumulative impacts on such species would be specifically considered and reduced or eliminated through conservation and mitigation measures identified during those relevant processes and consultations.

4.13.3.8 Land Use, Special Interest Areas, and Visual Resources

Projects with permanent aboveground components, such as buildings, residential projects, and roads, and aboveground electrical transmission lines, would generally have greater impacts on land use than the operational impacts of a pipeline (including gathering lines for Marcellus Shale development and nonjurisdictional project-related facilities), which would be buried and thus allow for most uses of the land following construction. Therefore, except for aboveground facilities and the permanent right-of-way (including a permanent conversion of forested land to herbaceous cover), pipeline projects typically only have temporary impacts on land use. The majority of long-term or permanent impacts on land use are associated with vegetation clearing and maintenance of the pipeline right-of-way.

The projects listed in table W-1 in appendix W combined would disturb over 50,000 acres of land, affecting a variety of land uses. Our analysis focused on the potential cumulative land use impacts on projects close by or immediately adjacent to ACP and SHP construction workspaces. Of the projects listed in table W-1 in appendix W, those with the greatest potential for impacts include the FERC-jurisdictional pipelines, the nonjurisdictional project-related facilities, oil and gas exploration and production projects, residential developments, and the transportation projects that cross the proposed pipeline routes.

ACP and SHP could result in cumulative impacts on recreation such as fishing, hunting, biking, etc., and special interest areas if other projects affect the same areas or feature at the same time, which would include the MNF and GWNF. Atlantic and DETI have committed to coordinating with the land-managing agencies of these areas to avoid or reduce impacts associated with constructing during peak use periods, constructing through areas with special management purposes, allowing for continued use during and following construction, and restoring the area to preconstruction conditions. In general, the other FERC-regulated projects would conduct similar coordination with the landowners and land-managing agencies of these recreation and special interest areas.

The visual character of the existing landscape is defined by a combination of physical (geologic and topographic), biological, and cultural attributes that make it unique. Landscapes can be fully "intact" and natural appearing, or they can reveal historic and current land uses such as recreation, conservation, and development. The visual qualities of the landscape are further influenced by existing linear installations such as highways, railroads, pipelines, and electrical transmission and distribution lines. Within this context, the pipelines, wells, and residential developments listed on table W-1 in appendix W would have the greatest cumulative impact on visual resources in the proposed project area. ACP and SHP would add incrementally to this impact, but the overall contribution would be relatively minor given that most projects would be buried pipeline. Existing vegetation around both projects' aboveground facilities would shield surrounding areas from visual impacts. Additionally, disturbed areas would be revegetated as appropriate. The impact of oil and gas development activities on land use, recreation, special interest areas, and visual resources would vary widely depending on the location of specific facilities and access roads, but would be minimized to the extent possible through the federal and state agency review and permitting process.

The greatest visual impact of ACP and SHP, combined with the other projects listed in table W-1 in appendix W, would be primarily from the conversion of forest land to scrub-shrub or herbaceous vegetation types. Permanent visual impacts would also be present where permanent structures (e.g., compressor stations, houses, buildings, guardrails) would remain. Whereas these permanent visual impacts may be locally noticed, generally they would not be inconsistent with the existing visual character of the area. Also of consideration for long-term visual impacts would be the cleared permanent operational pipeline easement viewed from KOPs. In select areas where recreational experiences are important values, such as at the ANST crossing and BRP crossing, Atlantic conducted additional visual simulations, and is assessing visual impacts on those resources in communications with the NPS, FS, and ATC. In selected areas such as views from the ANST to the pipeline right-of-way and at the ANST crossing in the GWNF, the potential for visual impact is elevated and thus may be mitigated further by the appropriate regulatory agency. Users of the trail may be more sensitive to the impacts associated with the projects given its management as a remote area that is relatively unencumbered by manmade features. ACP and MVP would cross both the BRP and ANST, thereby potentially contributing to cumulative impacts. Though users would not see both the MVP and ACP crossings from any one viewpoint, multiple viewings of both pipelines within a short duration of time would be seen. For example, both cross U.S. 11 and U.S. 81 and recreationalists along these highways would see these crossings. Use of the HDD method (ACP) and bore method (MVP) would reduce the impacts of the project on vegetation and visual resources compared to other conventional open-cut crossing methods. Atlantic would continue to consult with the FS, NPS, and ATC on routing to minimize impacts on these lands, where feasible.

Following construction, views of the new pipeline corridors would be visible to hikers along the ANST at multiple locations as discussed in the VIA conducted for each project. Limiting the permanent right-of-way to 50 feet and adhering to the restoration and right-of-way maintenance measures outlined in Atlantic's and DETI's *Plan, Procedures, Restoration and Rehabilitation Plan*, and *COM Plan* on federal lands would also reduce the impacts associated with the projects.

The visual impact of oil and gas production would occur primarily from the conversion of forested land to scrub-shrub or herbaceous vegetation types. Permanent visual impacts would occur in developed areas where permanent structures (e.g., houses, buildings, guardrails) would remain. Whereas these permanent visual impacts may be locally noticed, generally they would not be inconsistent with the existing visual character of the area. However, in selected areas such as at the ANST crossing, the potential for visual impact is still being assessed and may be mitigated further following the completion of Atlantic's consultation with the FS, NPS, and ATC.

Given the proposed projects' mitigation measures, and additional mitigations as needed based on the ongoing visual assessment, cumulative impacts on land use, recreation, special interest areas, and visual resources would mostly be limited to the construction phase (except as noted above) and would be temporary and minor, we conclude that cumulative impacts on these resources would not be significant.

4.13.3.9 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the region of influence for ACP and SHP. The socioeconomic issues considered in the area of ACP and SHP were employment, housing, public services, transportation, property values, economy and tax revenues, and environmental justice.

The projects considered in this section would have cumulative effects on employment during construction if more than one project is built at the same time. Atlantic and DETI have estimated that about 8,400 total workers would be used to build ACP, all of whom would be working during peak construction. DETI estimates that approximately 1,970 construction workers would be used to construct SHP, all of whom would be working at peak construction. Atlantic and DETI estimate that 82 and 10 permanent employees would be employed to support operations of ACP and SHP facilities, respectively. Due to the relatively low populations, if multiple similar projects are built at the same time, the demand for workers could exceed the local supply of housing and public services. These projects would also result in a spike in employment levels (assuming a percentage of the local population is utilized) and the local economy. Construction of ACP and SHP would have a beneficial, short-term impact on employment, local goods and service providers, and state governments in the form of sales tax revenues.

Temporary housing would be required for non-local construction workers. Given the current vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms available near the projects, construction workers should not encounter difficulty in finding temporary housing. If construction takes place concurrently with other projects, particularly during peak tourist periods, temporary housing would still be available but may be slightly more difficult to find and/or more expensive to secure. Regardless, these effects would be temporary, lasting only for the duration of construction, and there would be no long-term cumulative impact on housing.

The cumulative impact of the proposed projects and the other projects listed in table W-1 in appendix W on infrastructure and public services would depend on the number of projects under construction at one time. The small incremental demands of several projects taking place at the same time could become difficult for police, fire, and emergency service personnel to address. The impact would be temporary, only for the duration of construction, and could be mitigated by the various project sponsors providing their own personnel to augment the local capacity or by providing additional funds or training for local personnel.

Construction of ACP and SHP could result in temporary impacts on road traffic in some areas and could contribute to cumulative traffic, parking, and transit impacts if other projects are scheduled to take place at the same time and in the same area. The local road and highway system near ACP and SHP is readily accessible by interstate highways, U.S. highways, state highways, secondary state highways, county roads, and private roads. Atlantic and DETI would use major highways and the construction right-of-way, to the extent practicable, to reduce impacts on local roadways. It is likely the other projects listed in table W-1 in appendix W would also use existing public roads. In addition, increased use of local roadways from multiple projects could accelerate degradation of roadways and require early replacement of road surfaces. However, Atlantic, DETI, and the other project sponsors in the geographic scope of influence would be required to adhere to local road permit requirements (which may have provisions for road damage repairs or compensation) and road weight restrictions.

The proposed projects would not contribute to any long-term cumulative impact on the transportation infrastructure, because only a small number of new permanent employees would be required to operate ACP and SHP.

4.13.3.10 Cultural Resources

Cumulative impacts on cultural resources would occur only if other projects were to impact the same historic properties impacted by ACP and SHP. The currently proposed projects listed in table W-1 in appendix W that are defined as federal actions (for example, all FERC-regulated projects) would include mitigation measures designed to avoid or minimize additional direct impacts on cultural resources. Where direct impacts on significant cultural resources are unavoidable, mitigation (e.g., recovery of data and curation of materials) would take place before construction. Non-federal actions would need to comply with any mitigation measures required by the affected states. The Applicants developed project-specific plans to address unanticipated discoveries of cultural resources and human remains in the event they are discovered during construction. Therefore, the proposed projects may incrementally add to the cumulative effects of other projects that may occur at the same time. However, this incremental increase would not be significant.

Atlantic and DETI have surveyed about 94.5 percent and 99.8 percent, respectively, of their pipeline routes and off-corridor workspaces for cultural resources. At this time, 145 cultural sites are known to be listed on or potentially eligible for listing on the NRHP, and several still require further evaluation to determine eligibility. Atlantic has conducted evaluative testing at 37 archaeological sites in the ACP APE; and DETI conducted evaluative testing at 1 site in the SHP APE. SHPO comments on several testing reports are pending. Atlantic and DETI identified 57 cemeteries in the ACP APE and 3 cemeteries in the SHP APE. Treatment plans are pending. For those historic properties that cannot be avoided by ACP, an adverse effect assessment would be made in accordance with 36 CFR 800.5 and, for eligible sites identified on NFS lands that cannot be avoided, a section 106 MOA would be negotiated to mitigate adverse effects per 36 CFR 800.6 prior to the signing of the Final ROD by the FS.

Disturbances to cultural resources in the project area not related to ACP and SHP could include illegal artifact collection; intentional destruction or vandalism; and accidental impacts from agricultural, logging, mining, or recreational activities or infrastructure construction and maintenance operations. The Antiquities Act of 1906, NHPA, Archaeological and Historic Preservation Act of 1974, and ARPA protect cultural resources on federal and tribal lands. The Native American Graves Protection and Repatriation Act would provide for the treatment of Native American graves and items of cultural patrimony found on federal lands.

Any project that qualifies as a federal action would have to adhere to section 106 of the NHPA, including those projects listed in table W-1 in appendix W. The federal agencies that would manage those projects would have to follow the regulatory requirements of 36 CFR 800. Under those regulations, the lead federal agency, in consultation with the SHPO, would have to identify historic properties in the APE, assess potential impacts, and resolve adverse effects through an agreement document that outlines a treatment plan.

Because it is not known how other foreseeable actions would affect cultural resources, we cannot make any definitive quantitative statements about the nature of cumulative impacts on historic properties. However, we can conclude that given the state and federal laws and regulations that protect cultural resources, mentioned above, it is not likely that there would be significant cumulative impacts on historic properties, resulting from ACP and SHP in addition to other projects that may take place within the geographic scope of influence.

4.13.3.11 Air Quality and Noise

Air Quality

Construction of ACP and SHP and the projects listed in table W-1 in appendix W would involve the use of heavy equipment that would generate air emissions, including fugitive dust. Most of these impacts, except for HDD installations, would be minimized given the construction activities would occur over a large geographical area and would be transient in nature. The construction emissions associated with ACP and SHP would be temporary and would be minimized by mitigation measures such as using properly maintained vehicles and commercial gasoline and diesel fuel products with specifications to control pollutants.

Air emissions resulting from diesel- and gasoline-fueled construction equipment and vehicles for ACP and SHP would be minimized by federal design standards required at the time of manufacture of the equipment and vehicles, and would comply with the EPA's mobile and non-road emission regulations found in 40 CFR Parts 85, 86, and 89. While fugitive dust impacts would also be temporary and not be expected to affect local or regional air quality, implementation of Atlantic's and DETI's *Fugitive Dust Control and Mitigation Plan* in construction work areas would minimize the effects of fugitive dust emissions. Fugitive dust generated by other projects in the area would be limited to the vicinity of the construction activities. ACP and SHP construction schedules may overlap with some of the projects listed in table W-1 in appendix W and would be constructed in close proximity. However, many of those projects are minor (road construction) and would not result in significant cumulative impacts. Further, several of the nearest projects listed in table W-1 in appendix W, such as the MVP and Rover, are FERC-regulated, and would be subject to the same requirements and mitigation measures as ACP and SHP.

Except for GHG emissions, air impacts from construction of ACP and SHP would be localized and confined primarily to the airsheds in which the activities take place. In all counties crossed, the projects' estimated emissions would be below the *de minimis* threshold for a general conformity determination, therefore impacts would not be expected to result in a significant impact on local or regional air quality. The combined effect of multiple construction projects in the same airshed, AQCR, and timeframe as ACP and SHP, such as the MVP and Rover, could temporarily add to the ongoing air quality effects of existing activities. However, the contribution of ACP and SHP to the cumulative effect of all foreseeable projects would be temporary. The projects listed in table W-1 in appendix W have varying construction schedules and would take place over a relatively large geographic area, further reducing any potential cumulative impacts on air quality. Table 4.13.3-1 provides the estimated construction emissions from the nonjurisdictional Smithfield Regional Office and Hastings Compressor Station. These emissions are separate from ACP and SHP, but are being disclosed due to its proximity.

TABLE 4.13.3-1

Estimated Construction Emissions from Nonjurisdictional Facilities

Facility	NO_X	CO	VOC	SO_2	PM	PM_{10}	$PM_{2.5}$	CO_2
	(total tons during construction activities)							
Smithfield M&R Station and Operations Regional Office	4.39	4.37	0.724	0.008	39.5	14.9	2.84	1,420
Hastings Compressor Station	0.623	0.364	0.099	0.001		0.306	0.097	224

It is likely that mitigation measures similar to those employed for ACP and SHP would be required for other projects to protect ambient air quality, thereby reducing the extent of cumulative impacts on air quality that could occur if projects are constructed within the same timeframe and within the same geographic scope of influence. For example, the MVP and Rover are FERC-regulated and would be subject to the same requirements as ACP and SHP. Industrial-type projects, including construction at the Hastings Compressor Station, would be required to adhere with any applicable regulations promulgated by the CAA. As established throughout section 4.11 and further demonstrated by air quality modeling, construction of ACP and SHP would not have a significant long-term, adverse impact on air quality and would not add significantly to the long-term cumulative impact of other projects.

Operation of ACP and SHP pipelines would generate emissions from maintenance vehicles and equipment, as well as vented and fugitive GHG emissions. The projects' compressor stations would primarily generate GHG, NO_X, VOC, CO, HAP, and PM emissions, and to a lesser extent, SO_2 emissions. Emissions associated with the various FERC-regulated projects would result in cumulative operational impacts on air quality; however, each compressor station would be required to comply with permit conditions based on CAA regulations and Virginia, Pennsylvania, West Virginia, and North Carolina state implementation plans. Fugitive pipeline emissions would be limited to GHG, which would not necessarily translate to impacts on local air quality (climate change and cumulative GHG emissions are discussed below).

Operational emissions from the nonjurisdictional power stations are estimated in table 4.13.3-2, below. The emissions associated with these facilities are independent of ACP and SHP, but have been disclosed as part of this cumulative impacts analysis. While ACP would deliver natural gas to the Brunswick and Greenville County Power Stations, these facilities are independent of the proposed projects.

TABLE 4.13.3-2 **Estimated Operating Emissions from Nonjurisdictional Facilities**							
	NO_X	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Facility	(total tons during construction activities)						
Brunswick Power Station	343.6	605.5	328.0	50.9	217.4	217.4	5,348,050
Greenville County Power Station	367.6	870.6	645.5	56.1	186.7	186.7	5,758,869

Ongoing drilling activities of Marcellus Shale natural gas reserves and other projects in the area, such as nonjurisdictional facilities, would involve the use of heavy equipment that would generate emissions of air contaminants and fugitive dust during construction. Because pipeline construction moves through an area quickly, air emissions associated with pipelines would be intermittent and short-term. Most of these impacts would be minimized further because the construction activities would take place over a large geographical area and, in many cases, construction schedules would not directly overlap. Although these projects would result in short-term construction air emissions, they are not likely to significantly affect long-term air quality in the geographic scope of influence. Operation of ACP and SHP, Marcellus Shale drilling activities, other FERC-jurisdictional projects, and other nearby projects would also contribute cumulatively to existing air emissions. As with the operational impacts of ACP and SHP, operation of other nearby, similar projects would generate emissions from maintenance vehicles and equipment, as well as vented and fugitive GHG emissions, which would contribute to cumulative impacts on air quality within the region of influence. We expect that operation of nearby, similar projects would be required to comply with the same permit requirements, and mitigation measures as ACP and SHP.

Noise

ACP and SHP could contribute to cumulative noise impacts. However, the impact of noise is highly localized and attenuates quickly as the distance from the noise source increases; therefore, cumulative impacts are unlikely unless one or more of the projects listed in table W-1 in appendix W are constructed at the same time and location. Based on the schedule and proximity of these activities to the pipeline route, there may be some cumulative noise impacts. However, since most noise impacts associated with ACP and SHP would be limited to the period of construction and most construction activities would take place during daytime hours and be intermittent rather than continuous, the noise contribution from ACP and SHP to cumulative noise impacts would primarily be for only short periods of time when the construction activities are at a given location.

Operation of ACP and SHP compressor stations would result in noise from the engines, gas aftercoolers, utility coolers, fuel gas regulation skids, discharge and suction piping, blowdown vents, engine air intakes, engine exhaust systems, and compressor and engine casings. Based on the analyses conducted and mitigation measures proposed, we conclude that ACP and SHP compressor stations would not result in significant noise impacts on residents, or the surrounding communities during operation as noise levels are expected to be below our 55 dBA L_{dn} requirement, and in most cases, the noise increase would be near or below the 3 dBA threshold of perception. For there to be a cumulative impact, noise associated with ACP and SHP and any of the projects listed in table W-1 in appendix W would have to affect the same NSAs. The closest facilities to ACP and SHP (within about 0.5 mile) are transportation (highway/road work), and pipelines, which would either have temporary noise impacts or no perceptible noise impacts at nearby NSAs. Construction and operation of other FERC-jurisdictional projects, such as the MVP and Rover, would be required to adhere to similar noise requirements and mitigations measures as ACP and SHP.

Noise from construction of the nonjurisdictional Hastings Compressor Station would likely occur simultaneously with construction of SHP. Noise generated during construction of this facility would be less intensive than construction at the Mockingbird Hill Compressor Station due to its limited scope. In addition, construction of the Hastings Compressor Station would not likely affect nighttime noise levels. We conclude that there would be no significant cumulative impact on noise resulting from construction of the Hastings and Mockingbird Hill Compressor Stations.

4.13.3.12 Climate Change

We received several comments expressing concern about ACP's and SHP's contribution to global climate change. Climate change is the adjustment in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change. The cumulative impact analysis described below does not focus on a specific cumulative impact area because climate change is a global phenomenon.

The Intergovernmental Panel on Climate Change is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the Intergovernmental Panel on Climate Change and participates in the Intergovernmental Panel on Climate Change working groups to develop reports. The leading U.S. scientific body on climate change is the U.S. Global Change Research Program. Thirteen federal departments and agencies participate in the U.S. Global Change Research Program, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990.

The Intergovernmental Panel on Climate Change and USGCRP have recognized that:

- globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests is primarily responsible for this accumulation of GHG;
- these anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.

In May 2014, the U.S. Global Change Research Program issued a report, Climate Change Impacts in the United States, summarizing the impacts that climate change has already had on the United States and what projected impacts climate change may have in the future (U.S. Global Change Research Program, 2014). The report includes a breakdown of overall impacts by resource and impacts described for various regions of the United States. Although climate change is a global concern, for this analysis, we will focus on the potential cumulative impacts of climate change in ACP and SHP project areas.

The U.S. Global Change Research Program's report notes the following observations of environmental impacts that may be attributed to climate change in the Northeast region:

- from 1895 to 2011 the Northeast experienced a nearly 2 °F temperature increase;
- from 1958 to 2010 the Northeast experienced a 70 percent increase in the amount of precipitation falling in heavy events and 5 to 20 percent increase in average winter precipitation;

- temperatures are projected to increase by 4.5 to 10 °F by the 2080s under the worst-case scenario (continually increasing emissions), and would increase by 3 °F to 6 °F if emissions were decreased;
- the number of days above 90 °F are projected to increase, resulting in major human health implications;
- the global sea level has risen by about 8 inches since reliable record keeping began in 1880, and is projected to rise another 1 to 4 feet by 2100;
- higher than average sea level rise along the Northeastern coast will occur due to land subsidence;
- increased fall and winter precipitation could damage crops, and wetter springs would result in delayed planting of grain and vegetables;
- risks to the Chesapeake Bay will be exacerbated by climate change, including disruption of certain fish species and increased invasive species.
- coastal water temperature in several regions are likely to continue warming as much as 4 to 8 °F by 2100;

The U.S. Global Change Research Program's report notes the following observations of environmental impacts that may be attributed to climate change in the Southeast region:

- from 1970 to 2014 the Southeast experienced an average temperature increase of 2 °F, although this region has cycled between warm and cool periods in the last century;
- the number of days above 95 °F during the daytime and 75 °F at night are projected to increase;
- regional average temperature will increase by 4 °F to 8 °F by 2100 under an increased (worst-case) emissions scenario.
- ground level ozone is projected to increase in the 19 largest urban areas of the Southeast, impacting public health;
- coastal wetlands are at risk from sea level rise, and a reduction in wetlands increases the loss of important fishery habitat;
- heat stress could impact dairy and livestock production, shifting dairy production northward; and
- a 2.2 °F increase in temperature would likely reduce overall productivity for corn, soybeans, rice, cotton, and peanuts across the Southeast, although rising CO_2 levels could partially offset these decreases.

GHG emissions are a primary cause of climate change (EPA, 2016d). Of the GHGs emitted, CO_2 is the most prevalent, accounting for 76 percent of all U.S. emissions since 1990 (EPA, 2016d). CH_4 is the second most prevalent. Overall, from 1990 to 2014, total emissions of CO_2 increased by 440.2 million metric tons of CO_2e (8.6 percent), while total 7 emissions of methane decreased by 37.4 million metric tons of CO_2e (5.0 percent), and total emissions of N_2O increased by 1.9 million metric tons of CO_2e (0.5 percent) (EPA, 2016d). This was in part due to natural carbon sequestration, such as forested areas and trees in urban areas.

Although the amount of CH_4 being emitted into the atmosphere by the projects is significantly less than that of CO_2, the comparative impact of CH_4 on climate change over a 100-year period (its GWP) is more than 20 times greater (more information on GWP can be found in section 4.11.1.1). Fugitive CH_4 emissions are common in natural gas systems and can occur during natural gas production, transmission, storage, and distribution. CO_2 from fossil fuel combustion, which include coal, natural gas, and other fossil fuels, is the largest contributor to GHG emissions, accounting for approximately 76 percent of CO_2e since 1990 (EPA, 2016d).

Burning natural gas emits less CO_2 compared to other fuel sources (e.g., fuel oil or coal). Because coal is widely used as an alternative to natural gas in the region of influence of the proposed projects, it is anticipated that the projects would result in the displacement of some coal use, thereby potentially offsetting some regional GHG emissions. However, the emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts previously described. Because we cannot determine the projects' incremental physical impacts on the environment caused by climate change, we cannot determine whether the projects' contribution to cumulative impacts on climate change would be significant.

The GHG emissions associated with construction and operation of ACP and SHP, including mitigation measures to reduce methane emissions are discussed in more detail in section 4.11.1. Although the GHG emissions from construction and operation of the projects appear large, the emissions are small in comparison to the GHG emissions for each state (245,300,000 metric tpy of CO_2 in Pennsylvania, 98,400,000 metric tpy of CO_2 in West Virginia, 126,800,000 metric tpy of CO_2 in North Carolina, and 104,000,000 in Virginia).[50] We note that this comparison provides a frame of reference for the general magnitude of GHG emissions, and is not an indicator of significance.

GHG emissions from the proposed projects and other regional projects would not have any direct impacts on the environment in the projects area. Currently, there is no scientifically-accepted methodology available to correlate specific amounts of GHG emissions to discrete changes in average temperature rise, annual precipitation fluctuations, surface water temperature changes, or other physical effects on the environment in the Midwest region. However, contributions to GHG emissions globally results in the climate change impacts discussed above for the Northeast and Southeast regions.

Climate change impacts, such as increased precipitation, flooding, erosion, and scouring could potentially result in pipeline exposure. Pipelines are typically buried at least 3 feet below grade and are routinely inspected and maintained per regulations at 49 CFR 192, including discovery and handling of any exposed pipeline. As stated in section 4.12.1, to prevent corrosion, the ACP and SHP would be constructed using pipe with an external coating capable of withstanding stress from a variety of environmental sources, including oxygen, water, and other chemicals. As such, the pipelines would not likely be significantly impacted by climate change. Flooding could impact aboveground facilities, potentially resulting in service outages. Compressor stations would employ backup generators in the event of loss of power. Due to the

[50] The data for state-level GHG emissions were obtained from the U.S. Energy Information Administration's Energy Related Carbon Dioxide Emissions at the State Level, 2000-2014. https://www.eia.gov/environment/emissions/state/analysis/pdf/stateanalysis.pdf.

nature of pipeline systems, loss of service on one portion of the system would likely be offset by employing facilities elsewhere along the pipeline.

We received comments stating that our climate change analysis should include a lifecycle analysis of ACP and SHP, including end use of the natural gas over the lifetime of the pipeline, in accordance with CEQ's *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* issued on August 1, 2016.[51] The Commission staff's longstanding practice is to conduct an environmental review for each proposed project, or a number of proposed projects that are interdependent or otherwise interrelated or connected. Actions are "connected" if they: "[a]utomatically trigger other actions which may require environmental impact statements;" "[c]annot or will not proceed unless other actions are taken previously or simultaneously;" or "[a]re interdependent parts of a larger action and depend on the larger action for their justification."[52] NEPA does not, however, require us to engage in speculative analyses or provide information that will not meaningfully inform the decision-making process. Even if we were to find a sufficient connected relationship between the proposed project and upstream development or downstream end-use, it would still be difficult to meaningfully consider these impacts, primarily because emission estimates would be largely influenced by assumptions rather than direct parameters about the project. Stakeholders and other interested parties should review the DOE's National Energy Technology Laboratory's May 29, 2014 report: *Life Cycle Analysis of Natural Gas Extraction and Power Generation.* This report looks at the lifecycle of natural gas from various sources and compares the lifecycle GHG emissions to other fuels used for energy production (most notably coal). The report indicates that, although natural gas may have higher upstream GHG than coal, the total lifecycle GHG emissions from electricity production using natural gas is significantly lower than that of electricity from coal. In addition, emissions of criteria pollutants, and HAPs are significantly less from natural gas combustion than for coal. For a typical (baseload) case, the report indicates that the lifecycle emissions of electricity from natural gas are less than half that of coal.

As discussed above, the upstream production and downstream combustion of gas is not causally connected because the production and end-use would occur with or without the projects. Therefore, the circumstances in this case do not warrant the inclusion of production or end-use as an indirect effect of the projects. While upstream and downstream emissions are not causally connected to the projects, we recognize the availability of a reasonable, EPA-developed methodology to estimate the downstream GHG emissions from a project, assuming all the gas to be transported is eventually combusted. As such, we estimated the GHG emissions from the end-use combustion of the natural gas to be transported by the projects. For a basic analysis of downstream end-use, ACP and SHP would deliver 1.5 Bcf/d of firm and interruptible natural gas service. This is would result in approximately 29,957,375 tpy CO_2e emitted from end users and is equivalent to 1 year of electricity to 4,423,712 homes.[53] About 79 percent of the capacity for ACP would be used for fuel to generate electricity; section 4.13.3.11 identifies the GHG emissions from two power generation facilities that would be served by ACP. Because natural gas emits less CO_2 compared to other fuel sources (e.g., fuel oil or coal), it is anticipated that the eventual consumption of the distributed gas to converted power plants would reduce current GHGs emissions, thereby potentially offsetting some regional CO_2 emissions. The remaining capacity for ACP and that of SHP would be served by local distribution companies that deliver gas supplies to residential, commercial, and industrial customers;

[51] March 28, 2017; Presidential Executive Order on Promoting Energy Independence and Economic Growth directed the CEQ to recind the Guidance.

[52] 40 C.F.R. § 1508.25(a)(1)(i)-(iii).

[53] The EPA's GHG equivalency calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator) was used to estimate the CO_2e emissions from the proposed natural gas volume, then compared to GHG emissions from common sources. The CO_2e estimate is conservative and assumes the total capacity is used 24 hours per day, 365 days per year.

therefore, the precise end-uses of all the natural gas that would be transported by the projects is unknown, and the GHG emission figure provided here represents a conservative estimate.

On August 3, 2015, the EPA released the final Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electric Utility Generating Units, also known as the Clean Power Plan (CPP). The CPP sets CO_2 emission standards for power plants and establishes customized goals for states to reduce CO_2. Carbon dioxide accounts for approximately 84 percent of all U.S. GHG emissions. Under the federal Clean Air Act, each state is required to develop a state-specific compliance plan to meet individual state targets set by the EPA or be subject to the Federal Plan (PADEP, 2016b). According to the CPP all state goals fall in a range between 771 pounds per megawatt-hour (states that have only natural gas plants) to 1,305 pounds per megawatt-hour (states that only have coal/oil plants). A state's goal is based on how many of each of the two types of plants are in the state. West Virginia's 2030 goal is 1,305 pounds per megawatt-hour; Pennsylvania's 2030 goal is 1,095 pounds per megawatt-hour; and Virginia's 2030 goal is 934 pounds per megawatt-hour. We note, however, that on March 28, 2017, President Trump signed an EO that directs the EPA to "as appropriate" initiate rulemaking to suspend, revise, or rescind the CPP and related actions. Although the CPP is currently subject to challenge in the D.C. Circuit and has been stayed by the Supreme Court, the EO directs the Department of Justice to inform the D.C. Circuit of the EPA's plans and ask the court to put those challenges on hold while the EPA takes action to rescind or revise the rule.

As discussed above, we have disclosed the potential GHG emissions from the projects, mitigation measures to minimize GHG emissions, climate change impacts associated with the projects, and the impacts of climate change on the projects. As emissions have been minimized, we conclude that ACP and SHP would not significantly contribute to GHG cumulative impacts or climate change.

4.13.3.13 Reliability and Safety

Impacts on reliability and public safety would be mitigated using the DOT Minimum Federal Safety Standards in 49 CFR 192, which are intended to protect the public and to prevent natural gas facility accidents and failures. In addition, Atlantic's and DETI's construction contractors would be required to comply with the OSHA and Health Regulations for Construction in 29 CFR 1926. No cumulative impacts on safety and reliability are anticipated to occur as a result of ACP and SHP.

4.13.3.14 Monongahela and George Washington National Forests

ACP would cross 21.2 miles of the MNF and GWNF. Construction of the pipeline would impact a total of about 434 acres in MNF and GWNF, including the pipeline right-of-way and access roads. Operation of the pipeline would affect a total of about 220 acres in the MNF and GWNF, including the long-term right-of-way easement and long-term access roads. To be consistent with each forest's LRMP, several amendments would be required. These amendments would be for the implementation of ACP only. The *COM Plan* would include the mitigation measures and monitoring procedures designed to meet the resource protection that is intended with the amendments.

With exception of the WB XPress Project and MVP, no FERC-jurisdictional projects evaluated for the cumulative impacts analysis are within NFS lands. It is anticipated that any adverse impacts on sensitive resources within the MNF and GWNF (and the Jefferson National Forest, which is proposed to be crossed by the MVP) resulting from any other types of projects considered in our analysis would be regulated through project design, BMPs, and NFS permitting. Therefore, we conclude that the cumulative impacts associated with ACP and SHP, when combined with other known or reasonably foreseeable projects in the geographic scope of influence, would not be cumulatively significant.

4.13.3.15 Conclusion

Most cumulative impacts would be temporary and minor when considered in combination with past, present, and reasonably foreseeable activities. Long-term but minor cumulative impacts would occur on wetland, upland forested vegetation, and associated wildlife habitats, as well as waterbodies, special status species, and visual quality. Impacts on vernal pools, rocky outcrops, and subterranean features could adversely affect habitat of wildlife species with limited mobility and home ranges. Subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a); therefore, it is possible that impacts associated with construction activities could have population-level effects on these species. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials. There is also the potential that ACP and SHP would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the proposed projects displaces the use of other more polluting fossil fuels.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the FS, USACE, EPA, FWS, WVDEP, and WVDNR. The federal cooperating agencies may adopt the EIS per 40 CFR 1506.3 if, after an independent review of the document, they conclude that their permitting requirements and/or regulatory responsibilities have been satisfied. However, these agencies would present their own conclusions and recommendations in their respective and applicable records of decision. Otherwise, they may elect to conduct their own supplemental environmental analysis, if necessary.

We have determined that with the implementation of Atlantic's and DETI's construction and restoration plans, and our recommendations, construction and operation of ACP and SHP would result in limited adverse environmental impacts, with the following exceptions. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, and has sited the pipeline to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the additional factors described in sections 4.1 and 4.2, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase landslide potential. Similarly, long-term impacts related to slope instability adjacent to waterbodies have the potential to adversely impact water quality and stream channel geometry, and therefore, downstream aquatic biota.

Atlantic and DETI would remove approximately 6,140 acres of forested vegetation and wildlife habitat, including approximately 4,920 acres of large (mature) trees. Through forest fragmentation, ACP and SHP would create an additional 30,000 acres of additional forest edge that would be susceptible to edge effects. Atlantic and/or DETI are also likely to adversely affect the ESA-listed Indiana bat, northern long-eared bat, Roanoke logperch, Madison cave isopod, clubshell mussel, small whorled pogonia, and running buffalo clover. ACP could have significant adverse impacts on karst, cave, subterranean habitat, and the species associated with subterranean habitat. Subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a); therefore, it is possible that impacts associated with construction activities could have population level effects on these species. Atlantic's and DETI's *Karst Mitigation Plan* (appendix I) outlines the measures that would be implemented to avoid or minimize these potential impacts. However, additional subterranean karst feature mapping surveys are pending, and could identify additional construction-related downstream impacts on subterranean obligate species.

Atlantic is pursuing negotiations for a 75-foot-wide permanent right-of-way easement for the AP-1 mainline, but has stated it would only maintain a 50-foot-wide permanent right-of-way during operation. Although Atlantic can pursue negotiations with landowners for a larger right-of-way, we do not concur that Atlantic's proposed 75-foot-wide permanent right-of-way is necessary to operate the AP-1 mainline. Based on our experience and review of similar projects, as well as our understanding of pipeline operations and maintenance procedures, we believe that a 50-foot-wide permanent right-of-way is sufficient to safely and efficiently operate large diameter natural gas pipelines. For these reasons, we are recommending that Atlantic not exercise eminent domain authority granted under section 7(h) of the NGA to acquire a permanent pipeline right-of-way exceeding 50 feet in width. In addition, where Atlantic has obtained a larger permanent right-of-way width through landowner negotiations, routine vegetation mowing and clearing over the permanent right-of-way should not exceed 50 feet in width.

Atlantic's and DETI's construction plans include modifications to our *Procedures* regarding the use of certain extra workspaces within or adjacent to waterbodies or wetlands. We have reviewed these specific requests and justifications and agree that they provide sufficient protection to the resource, and as such, we find these modifications acceptable. However, our review of waterbody crossings (appendix K), wetland crossings (appendix L), and Atlantic's and DETI's proposed workspaces indicate there are additional modifications to our *Procedures* that are not listed and justified; therefore, we are recommending that Atlantic and DETI design all workspaces that are not currently identified to comply with our *Procedures*. Any additional modifications to our *Procedures* must be requested and justified in Atlantic's and DETI's *Implementation Plans* (recommended Environmental Condition No. 6).

We received comments on the draft EIS from the FWS, FS, and individuals noting there are likely areas along the pipeline route where the recommended avoidance and minimization measures described throughout section 4 for a species or resource may conflict with recommendations for another. As such, we are recommending that, as part of its Implementation Plan (recommended Environmental Condition No. 6) and prior to receiving written authorization from the Director of the OEP to commence construction of any project facilities, Atlantic and DETI file with the Secretary environmental constraints maps, illustrating the avoidance and minimization measures required by the resource agencies, and committed to by Atlantic and DETI along the ACP and SHP routes.

As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of ACP and SHP. We are therefore recommending that our mitigation measures be attached as conditions to any authorizations issued by the Commission. A summary of the anticipated impacts, our conclusions, and our recommended mitigation measures is provided below, by resource area. In addition, Atlantic and DETI are required to obtain the applicable permits and authorizations to construct and operate the projects. As such, to the extent the federal, state, or local agency has regulatory authority and permitting jurisdiction, Atlantic and DETI would consult with the appropriate agency(ies). The applicable agency would have the opportunity to review Atlantic's or DETI's proposed projects during the permitting process and, if necessary, identify additional mitigation measures beyond those proposed in this EIS.

5.1.1 Geological Resources

Portions of ACP would traverse areas that are subject to potential karst development and hazards. Based on National Karst Map data, analysis of landscape features, and detailed geological mapping, ACP would cross 71.3 miles of karst terrain in West Virginia and Virginia. SHP would cross 1.1 miles of land that has the potential to contain karst features in Westmoreland County, Pennsylvania. The most prominent type of karst features in the ACP area are sinkholes, which comprise the greatest potential geohazard risk to any type of construction in karst terrain. Other karst features inventoried in the ACP area include caves, springs, and sinking streams. Atlantic and DETI developed specific plans and procedures to minimize and respond to karst activity during construction and operation of the proposed facilities, including Atlantic's *Karst Mitigation Plan*. Atlantic would perform an ERI survey to detect subsurface solution features along all portions of the route that are mapped as limestone bedrock at the surface prior to construction. During construction, Atlantic would employ a karst specialist to monitor the karst features identified along the right-of-way, monitor for karst features that may form during construction, and make an assessment regarding its potential impact and whether mitigation measures would be required.

An analysis of bedrock fracture lineaments aids in the identification of concentrated karst, and when coupled with existing dye trace studies can be utilized to extrapolate groundwater flow through a mature karst system. Atlantic would complete a fracture trace/lineament analysis utilizing remote sensing platforms (aerial photography and LiDAR), along with results of existing dye trace studies, to determine water flow from construction workspaces to area receptors such as caves, wells, and springs. However, the results of this analysis have not yet been completed. Therefore, we recommend that Atlantic provide the results of this analysis with its Implementation Plan. Atlantic should provide the results on a composite map(s), illustrating surficial karst features with the potential for intersecting shallow interconnected karst voids and cave systems over a wide area; specifically, between the pipeline and nearby water receptors (i.e., public water supply wells, municipal water supplies, private wells, springs, caves systems, and to surface waters receiving discharge).

We received comments on the draft EIS regarding the proposed crossing of Mingo Run and the potential for impacting the Simmons-Mingo cave system, a known bat hibernaculum where northern-long eared bats were captured during surveys. The Mingo Run Valley has been assessed by remote sensing and review of available data. Karst field surveys did not encounter any surface features between AP-1 MPs 65.0 and 65.7. Dye trace studies have confirmed a westward underground water flow between the Simmons Caves and the cave stream in the Simmons-Mingo cave system. ERI surveys are planned for this area in 2019, prior to construction, to evaluate the depth to bedrock voids and determine if any subsurface fractures are present that could be affected by blasting, resulting in stream diversion. Therefore, to ensure that this stream crossing and cave system are protected, we are recommending that Atlantic provide the results of the ERI studies with its Implementation Plan, along with any project design changes to avoid impacts on this crossing, cave system, and bat hibernacula.

The Virginia Cave Board commented that the ACP route would cross the Burnsville Cove Cave Conservation Site. Current GIS coverage received from the VDCR indicates that the proposed construction workspace is within 0.5 mile of the conservation site for over 2.0 miles. However, further consultation with the VDCR determined that the proposed ACP workspaces are to the south of the conservation site, and proposed trenching activities would not pass over or intercept any known cave systems in the Burnsville Cove Cave Conservation Site. In addition, several, but not all, access roads which would have passed through the conservation site have been rerouted outside of the Burnsville Cave Conservation Site. Additional comments noted the boundary of the Burnsville Cove Cave Conservation Site was based upon pre-existing data and may not accurately reflect the complete watershed boundary. Therefore, to ensure that this conservation site is protected, we are recommending that Atlantic consult with the VDCR to determine if the route alignment and construction activities would impact the Burnsville Cove Cave Conservation Site. Atlantic should file the results of its consultations with its Implementation Plan, along with any project design change proposals to avoid impacts on this site.

Atlantic's Karst Survey Report (GeoConcepts, 2017) identified two notable areas of concentrated karst development: the Cochran Cave area southwest of Staunton and an area southeast of Stuart's Draft that extends southward towards Sherando Camp. Additional areas of concern include the crossing of karst near Deerfield (approximate AP-1 MP 109) and two areas of concentrated sinkholes near Churchville (approximate AP-1 MPs 127 to 141) and Stuarts Draft (approximate AP-1 MPs 145 to 153). The area near AP-1 MP 109 does not appear to be included in the latest Karst Survey Report (GeoConcepts Engineering, 2017); therefore, we are recommending that Atlantic conduct a data review and field survey of potential karst features between AP-1 MPs 106.8 and 110, and should file this information, along with any mitigation measures, prior to construction.

GeoConcepts completed a subsurface ERI, hydrologic, and dye trace investigation of the Cochran's Cave Conservation Site in fall 2016 and filed the report with FERC in January 2017. The ERI and air track boring results showed three air-filled voids at a depth of greater than 20 feet below grade that would not be expected to impact the pipeline excavation. The hydrologic investigation results showed that Moffett Lake appears to be supplied by the Cave Spring and by an additional source. The dye trace investigation confirmed a hydraulic connection between the stream in Cochran's Cave No. 2 and the stream emerging from the spring cavern. While the VDCR would prefer that Atlantic avoid crossing the conservation site, it recognizes that there are other factors that may make avoidance impossible. The VDCR concludes that based on the studies completed on Atlantic's behalf, the route adjustments made, and Atlantic's commitments to use onsite karst specialists to monitor construction, the potential impacts on the cave have been mitigated to the maximum extent practicable.

To address requests identified by the VDCR, we are recommending that prior to completing any geotechnical boring in karst terrain, Atlantic consult with VDCR karst protection personnel regarding each geotechnical boring and follow the Virginia Cave Board's "Karst Assessment Standard Practice" for land development when completing the borings.

The primary geologic impact that could affect the proposed pipeline and aboveground facilities in karst sensitive areas is the sudden development of a sinkhole that damages the facilities and poses a safety risk. The proposed facilities would be designed, constructed, maintained, and monitored in accordance with modern construction standards and PHMSA regulations, which would reduce the potential for karst conditions to adversely impact the facilities. This is further supported by many miles of similar pipeline facilities that were installed using similar methods and have safely operated in karst-sensitive areas for decades. We also note that other residential, commercial, industrial, and infrastructure development has continued successfully in these areas. However, due to a plethora of public comments regarding pipeline integrity and safety in areas of potential karst collapse and subsidence, and because monitoring is a key element to providing safe operation of the pipeline over its lifetime, we are recommending that Atlantic provide a revised *Karst Terrain Assessment Construction, Monitoring, and Mitigation Plan* that includes monitoring of all potential karst areas for subsidence and collapse using LiDAR monitoring methods during the 1, 2, and 5 years following construction. While small, localized, and temporary impacts on karst features, water flow, and water quality could occur, the impacts would be adequately minimized and mitigated through Atlantic's and DETI's plans and our recommendations.

Atlantic has identified 26 coal mines that are crossed by ACP in West Virginia where the mine status is identified as abandoned, permit revoked, closed-released, or not started. Atlantic has also identified 15 non-fuel mineral mines (manganese, limestone, clay, shale, and sand and gravel) that are within 0.25 mile of ACP. SHP would cross over one known abandoned underground coal mine in Pennsylvania. In Virginia, coal adit may be present near Farmville, and there may be undocumented abandoned pits and shafts near AP-1 MPs 200 to 210. Atlantic is coordinating with these coal mine owners and/or operators to minimize and/or avoid impacts on these mines. All known underground mines are hundreds of feet below the ground surface, are room-and-pillar mines, and no impact is anticipated. Atlantic and DETI would design, construct, and monitor the facilities in accordance with applicable industry standards and PHMSA regulations which are protective of public safety. Based on the types of underground mines present, we conclude the potential for underground mine collapse to damage the proposed facilities has been adequately avoided and minimized.

ACP would cross approximately 84 miles of slopes greater than 20 percent and SHP would cross over 24 miles of slopes greater than 20 percent. Atlantic and DETI developed a Geohazard Analysis Program, which identified over 100 possible slope instability hazard locations and 46 steep slopes for further evaluation along ACP, and 76 possible slope instability hazard locations and 22 steep slopes for further evaluation along SHP. Atlantic and DETI are developing a Best in Class Steep Slope Management Program to incorporate the results of the Geohazard Analysis Program into the project design and to address issues of landslide potential and susceptibility. Because Phase 2 analysis, field surveys at all evaluation sites, and final measures related to slope hazards have not yet been completed for ACP and SHP, we are recommending that prior to construction Atlantic and DETI file all outstanding geotechnical studies and the results of geohazard analysis field reconnaissance; any recommendations proposed following the geotechnical studies and geohazard analysis field reconnaissance; a status of the BIC Team analysis related to ACP and SHP; and standard mitigation designs for each of the six categories that would be implemented in slope hazard areas during construction and operation of the projects. Also, Atlantic and DETI have developed a SAIPR to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction along the entire ACP and SHP.

While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted. Additionally, although the proposed pipelines have been cited to maximize ridgeline construction, numerous segment of pipeline would be constructed on steep slopes and in areas of high landslide potential. Considering the historic and recent landslide incidences in the immediate project area, along with the factors above, we conclude that constructing the pipelines in steep terrain or high landslide incidence areas could increase the potential for landslides to occur.

In order to assess potential project-induced landslide hazards and the effectiveness of proposed mitigation measures for restoration of steep slopes on NFS lands, Atlantic provided site-specific geohazard mitigation design drawings and related materials for steep slopes on the MNF and GWNF, including pipeline construction on 2,900 feet of sloping ridge on the northwest flank of Cloverlick Mountain, and the southwest flank of Little Ridge on the GWNF, one of the most challenging steep slope construction sites on the MNF or GWNF and representative of "worst case" construction sites. ACP's site-specific designs are informed by and are part of the BIC Team as well as the SAIPR developed to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction. ACP design analysis considers the potential hazards of failure of the temporary spoils, the restoration fill, and the excess temporary spoils. Accordingly, Atlantic developed designs to avoid, minimize, and mitigate these potential hazards. Thus, Atlantic has provided site-specific designs for the two main types of steep slope construction on both the MNF and GWNF: 1) ridgetop construction, and 2) side slope construction. The ACP design provided the cross-sections and profiles of the 1) original ground surface, 2) the temporary ground surface of cuts and fills (temporary spoils), and 3) final ground (restoration backfill to original contour). The designs, cross-sections, and profiles provide information the FS would use to focus on construction inspection. If ACP is authorized, the FS would work with Atlantic on review and approval of mitigation tailored to site-specific designs of these and other steep slope sites on the Forest.

The VDMME provided comments on the draft EIS noting the potential presence of Tertiary or Quaternary vertebrate and plant fossils in unconsolidated deposits in Virginia, in addition to Paleozoic and Mesozoic fossil types discussed above. To ensure that paleontological resources are adequately protected, we are recommending that Atlantic and DETI provide a *Plan for Discovery of Unanticipated Paleontological Resources* that describes how Atlantic and DETI would recognize and manage significant fossils encountered during construction. This plan would also describe the notification procedures to the appropriate authorities in each state crossed by ACP and SHP.

5.1.2 Soils

ACP and SHP would traverse a variety of soil types and conditions. Several soil characteristics have the potential to affect, or be affected by, construction and operation of a pipeline. These include erosion potential, depth to shallow bedrock, stony and rocky soils, compaction potential, revegetation concerns, drainage patterns, hydric soils, and prime farmlands or farmlands of statewide importance. Soil chemistry, including soil carbon, would also be affected by the construction and operation of the pipeline. Soil chemistry can be substantially altered from the native soil condition as well as an expected increase in soil carbon losses due to the exposure, mixing, fertilization, loss of soils through erosion, and change in vegetation where originally forested on the permanent right-of-way. Mitigation and design features would be applied to soil-disturbing activities to reduce impacts. The degree to which mitigation and design features would be applied would be based on performance and effectiveness of these measures during project implementation and restoration. Atlantic and DETI would implement mitigation measures contained in their construction and restoration plans to control erosion and enhance successful restoration. Specifically, soil impacts would be mitigated through measures such as topsoil segregation, temporary and permanent erosion controls, and post-construction restoration and revegetation of work areas. Atlantic and DETI would also implement plans to avoid and limit inadvertent spills of fuel and other hazardous substances, and to address pre-existing contaminated soil if encountered.

The projects would impact over 5,144 acres (43.7 percent) of soils that have a representative slope class greater than 8 percent. We analyzed the influence of slope percent as a variable factor in predicting soil erosion potential in rugged mountainous terrain. Based on this analysis, we find that construction practices would temporarily increase the erosion potential for soils crossed by ACP, but erosion rates should return to acceptable levels once final restoration has been completed. In addition, Atlantic's *Restoration and Rehabilitation Plan* and FERC *Plan* contain provisions for erosion control practices such as use of mulch and reestablishing vegetation within specific timeframes after construction is complete. Furthermore, because the construction timeframe is relatively short, we conclude that implementation of the measures in the *Restoration and Rehabilitation Plan* and FERC *Plan* should help ensure that there would not be a substantial increase in erosion potential in the project area in the long term.

Construction of ACP and SHP would also impact 4,006 acres of prime farmland and 3,938 acres of farmland of statewide importance; however, those areas of prime farmland or farmland of statewide importance that are temporarily impacted and currently in agriculture could return to that use after construction. Permanent impacts on soils would occur at aboveground facilities and access roads where structures and various surfaces would be installed. Construction of aboveground facilities and permanent access roads would permanently impact 208 acres of prime farmland and 206 acres of farmland of statewide importance.

The projects would impact approximately 9,047 acres (76.9 percent) of soils that have topsoil depths greater than 12 inches. Topsoil is the uppermost layer of soil and typically has the highest concentration of organic materials with generally greater biological productivity than subsurface soils. Topsoil preservation in forested areas is also important for restoration of natural vegetation and of the physical, chemical, and biological properties of the soil. Topsoil, including organic horizons, maintain hydrologic and nutrient cycles, both of which are key factors for successful revegetation, restoring natural hydrologic functions to support land stability and reduce erosion.

We received comments asking how excess rock and spoil would be disposed of during construction and if imported fill material would be used to restore the right-of-way. Excess rock and spoil would be hauled off to an approved disposal location or used as beneficial reuse, per landowner or land management agency approval and as required by permit requirements. At this time, Atlantic and DETI have not identified any areas where imported soils would be used. However, FERC notes that there are commercial disposal locations where permits have been obtained by the owner/operator for an activity or as a resource needed for the project. These facilities would function as such regardless of the projects, have been approved for their use by the state or county authority(ies), and are independent of FERC approval.

In addition to utilizing the SSURGO databases, the FS required Order 1 Soil Surveys for the portion of ACP on NFS lands. The Order 1 Soil Survey was used to make more informed decisions related to design, construction, restoration, and maintenance of the proposed pipeline, right-of-way, and other project components. Atlantic's *COM Plan*, developed with active participation and engagement from the FS, identifies measures to minimize potential soil impacts. Atlantic will continue to consult with the FS to address comments on the *COM Plan*.

We received multiple comments expressing concern about constructing in steeply sloped areas and the adequacy of using SSURGO data to assess potential soil impacts along the project route. As noted in section 4.2.2, the FS, as a land-managing agency, selected an Order 1 Soil Survey methodology based on direction from FS LRMP to use a method which inventories the soil resource to the appropriate intensity level as needed for project planning/and or design consideration. An Order 1 Soil Survey is based on a more precise degree of study, and therefore, a more detailed level of information than SSURGO databases. In many cases, mapping at an Order 1 level or collecting point data may reveal inclusions within map units of soils that were not named in the official soil survey as well as use-dependent soil properties that are different from the typical soil properties listed for map units in the "official" soil survey (NRCS, 2016b). The Order 1 Soil Survey is more accurate than the official soil survey for the extent of the right-of-way on NFS lands. However, SSURGO data provide the most detailed level of soil mapping that is publicly available from the NRCS and was designed primarily for farm and ranch, landowner/user, township, county, or parish natural resource planning and management; therefore, SSURGO data were used in the analysis on private lands.

The MNF is working towards establishing ways to incorporate carbon mitigation from large-scale soil disturbing projects to maintain or restore ecological integrity, so that ecosystems can resist change, are resilient under changing conditions, and are able to recover from disturbance. The FS determined 2,505 U.S. tons of carbon would be lost due to the removal of bole wood from the right-of-way during construction. As part of the restoration and revegetation of the right-of-way following construction, Atlantic has proposed the use of an organic soil amendment and the application of an erosion control material. These soil amendments would be applied to the entire area of disturbance on the MNF. Atlantic has agreed to apply twice the minimum application rate of each, which would fully replace the calculated soil carbon loss.

Construction-related impacts on soils would be temporary and localized to the construction workspace, except where erosion, sedimentation, landslides, and other forms of soil movement affect adjacent areas. Where these impacts may occur, there would be isolated, adverse effects to soil quality. Performance measures for addressing final soil productivity and soil quality during restoration activities on NFS lands are currently being developed by the FS and Atlantic.

5.1.3 Water Resources

5.1.3.1 Groundwater Resources

Four public and 236 private water supply wells were identified near ACP, and 18 private wells were identified near SHP; 1 of the public wells and 12 of the private wells are within the ACP workspace, and 1 is within the SHP workspace. Also, 124 and 4 springs were identified near ACP and SHP, respectively. Two of these springs were identified near ACP within the MNF, and six springs were identified within the GWNF. Because Atlantic and DETI continue to communicate with landowners to complete surveys for private water supply sources (wells and springs), we are recommending that Atlantic complete and file the results of the remaining field surveys for wells and springs within 150 feet of the construction workspace, and within 500 feet of the construction workspace in karst terrain. Prior to construction and pending landowner authorizations, Atlantic and DETI would test water supply wells and springs within 150 feet of the construction workspace (within 500 feet of the construction workspace in karst terrain). The preconstruction water source tests described above would provide baseline information to determine whether construction activities have adversely affected water sources. If a damage claim is filed with Atlantic or DETI, Atlantic and DETI would conduct post-construction water quality tests, which would be analyzed by a certified laboratory, to determine if water supply wells and springs were affected by construction activities. However, to further ensure wells and springs are not damaged by construction, we recommend Atlantic and DETI test all water supply wells and springs after construction that are within 150 feet of the construction workspace and within 500 feet of the construction workspace in karst terrain.

If damage occurred, Atlantic and DETI would provide a temporary potable water source, and/or a new water treatment system or well.

We received comments from landowners who contend that Atlantic has under-reported the number of wells and springs or seeps in proximity of the proposed pipeline route. In the event previously unidentified wells, springs, or seeps are encountered during construction, Atlantic and DETI would implement measures in their construction plans to reduce impacts and maintain the flow of water or springs/ seeps, including the use of mats to minimize rutting, diverting the flow of springs/seeps across the construction right-of-way as necessary, and restoring the ground surface to original contours as closely as practicable to re-establish original flow.

We have received numerous comments that wells and springs that are more than 500 feet from the construction workspace in karst terrain may be temporarily or permanently affected by construction activities, and that the pre-construction well and spring survey distance should be increased. Atlantic would employ a karst specialist to determine if construction activities could have an impact on the seeps and/or springs. Atlantic and DETI would implement the *Karst Mitigation Plan* to minimize impacts on karst systems. The results of the fracture trace and combined existing dye trace analysis would also aid in determining groundwater receptors beyond the 500-foot pre-construction survey distance that could potentially be impacted by construction. Wells and/or springs directly downgradient of or in the flow path of identified lineaments would be evaluated for testing. We encourage anyone who believes their well or spring may be affected by construction of the proposed projects to specifically request a preconstruction water quality and yield survey from Atlantic/DETI. Should construction activities affect a well or spring, landowners can negotiate the delivery of alternative water supplies and/or water sources with Atlantic/ DETI. If Atlantic and DETI are unresponsive or unwilling to negotiate, we encourage landowners to contact FERC's Landowner Helpline to investigate the problem.

Concerns were raised regarding the potential for construction activities to intercept subterranean streams or karst conduits and interrupt the water source. The likelihood of intercepting a saturated karst conduit is determined to be very low. Upon completion of construction, Atlantic and DETI would restore the ground surface as closely as practicable to original contours and re-establish vegetation to facilitate restoration of pre-construction overland water flow and recharge patterns. Atlantic and DETI would minimize impacts by implementation of the construction practices and operational erosion controls outlined in the FERC *Plan* and *Procedures*.

Three brownfield sites and four superfund sites have been identified within 1.0 mile of ACP. One mixed solid waste landfill, one industrial landfill, and two waste transfer stations have been identified within 0.5 mile of ACP, and 33 LUST sites are within 1,000 feet of ACP facilities. It is possible that previously undocumented sites with contaminated soils or groundwater could be discovered during construction of ACP and SHP. Local groundwater quality could be impacted by construction through existing contamination sites. Atlantic and DETI would implement a *Contaminated Media Plan* to address these circumstances and would complete post-construction water quality tests for water supply wells and springs within 500 feet of encountered contaminants. Implementation of the FERC *Plan* and *Procedures*, *Karst Mitigation Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Blasting Plan, SPCC Plan, SWPPPs, Slope Stability Policy and Procedures,* and *Fugitive Dust Control and Mitigation Plan* would limit any impacts from construction on groundwater resources. No long-term impacts on groundwater are anticipated from construction or operation of ACP and SHP because disturbances would be temporary, erosion controls would be implemented, natural ground contours would be restored, and the right-of-way revegetated. Temporary, minor, and localized impacts could result during trenching activities in areas with shallow groundwater (depth less than 10 feet below the ground surface) crossed by the pipeline. The greatest threat posed to groundwater resources would be during construction through mature karst terrain and from a hazardous material spill or leak into groundwater supplies. Implementing the strategies and methods presented in the *SPCC Plan* and *Karst Mitigation Plan* would prevent or limit such contamination should a spill occur. We do not anticipate any significant impacts on aquifers by the proposed ACP and SHP given their depth and the relatively shallow nature of construction.

5.1.3.2 Surface Water Resources

There are 1,669 waterbody crossings on ACP and SHP (including crossings by access roads), including 702 perennial, 642 intermittent, 228 ephemeral, 49 canals/ditches, and 48 open water ponds/reservoirs (some waterbodies are crossed more than once). This also includes 18 major waterbody crossings and 12 section 10 (navigable) waterbodies. No major waterbodies would be crossed by SHP. ACP would cross 4 perennial, 13 intermittent, and five ephemeral waterbodies on the MNF, and 13 perennial, 15 intermittent, and 6 ephemeral waterbodies on the GWNF.

Atlantic and DETI would use one of the following methods to install the proposed pipelines across waterbodies: the wet open-cut method, dry-ditch crossing methods (flume, cofferdam, and dam and pump), or trenchless method (HDD or bore). We received several comments that a dry-ditch crossing method should be used instead of the open-cut method. As proposed, 91 waterbodies would be crossed by the open-cut method. Most of these crossings are waterbody/wetland complexes which do not have a defined bed or bank, making a dry crossing method infeasible. Other waterbodies are ephemeral and would likely be dry at the time of the crossing, or have specific constraints that limit the ability to successfully complete a dry crossing method.

While site-specific drawings for most of the major waterbodies crossings have been provided, crossing design specifications and locations have changed since the most recent site-specific drawings were submitted, and site-specific construction and restoration measures have not been incorporated into the plans. We are recommending that Atlantic file updated site-specific crossing plans for major waterbody crossings with its Implementation Plan that include the location of temporary bridges and bridge type, appropriate cofferdam locations, water discharge structure locations, pump locations, and agency-imposed TOYR and construction and restoration requirements. In addition, separate intermittent waterbodies would be impacted by excavation and grading activities at the entry and exit workspaces of the BRP/ANST HDD. Because constructions activities at these locations could exceed a year, site-specific plans should be generated to minimize impacts on these waterbodies. Therefore, we are recommending that Atlantic provide site-specific plans to minimize and mitigate impacts on the waterbodies that would be impacted at the BRP/ANST HDD. Final plans should be developed in consultation the USACE and/or appropriate state agency(s).

Atlantic has proposed the HDD method at 15 main waterbodies; 10 additional tributaries would also be crossed by the 15 HDDs. The risk of hydrofracture was determined to be moderate, moderate-high, or high for four of these waterbodies (Western Branch Reservoir, Blackwater River, Nansemond River). Atlantic's *HDD Plan* would be implemented at each HDD crossing to minimize and address potential issues associated with HDD crossings, including an inadvertent release of drilling mud. No known contaminated waters or waterbody sediments have been identified along ACP and SHP. However, if contaminants are encountered during construction, Atlantic and DETI would implement the measures identified in its *Contaminated Media Plan*. In addition, due to the number of sensitive aquatic species and habitat that have the potential to occur during construction activities at two waterbodies (Neuse River and Nottoway River), we are recommending that Atlantic submit a hydrofracture potential analysis for these waterbodies, and if the potential for hydrofracture is low, utilize the HDD method at these crossings (see section 5.1.7).

Blasting may be required to install portions of the pipeline and would be done in compliance with federal, state/commonwealth, and local regulations governing the use of explosives and in accordance with Atlantic's and DETI's *Blasting Plan*. Should an inadvertent spill of fuels, lubricants, solvents, and other hazardous materials occur within a waterbody, Atlantic and DETI would implement their *SPCC Plan* to control and mitigate the inadvertent spill.

Atlantic is proposing to use about 141 million gallons of surface waters and municipal water for hydrostatic testing, dust control, and to construct HDDs; and DETI is proposing to use 7.1 million gallons for hydrostatic testing and dust control. Impacts associated with the withdrawal and discharge of water would be minimized by Atlantic's and DETI's adherence to their construction and restoration plans. In addition, Atlantic and DETI would obtain appropriate state water withdrawal and NPDES discharge permits, and would prevent spills during construction and operations through implementation of their respective spill plans.

To minimize water withdrawal/depletion impacts, Atlantic and DETI would slowly withdraw and store surface water in temporary, aboveground water impoundment structures adjacent to several withdrawal points. We received a comment that the proposed water impoundment structure near Jennings Branch would be sited on unlevel terrain that would not be appropriate for use. Our review of elevation and topographic information confirms that the proposed workspace may not be suitable. Therefore, we are recommending that Atlantic provide a site-specific plan for the water impoundment structure at Jennings Branch (AP-1 MP 129.1) or identify an alternative location for the structure.

Atlantic and DETI are still evaluating potential water sources for dust control; however, Atlantic and DETI have stated that water used for dust control or restoration activities would not be obtained from sensitive waterbodies. Due to the large quantity of water needed, we have recommended that Atlantic and DETI identify proposed or potential sources of water used for dust control, anticipated quantities of water to be appropriated from each source, and the measures that would be implemented to ensure water sources and its aquatic biota are not adversely affected by the appropriation activity.

Pipeline construction activities affecting surface waters would be conducted in accordance with Atlantic's and DETI's construction and restoration plans, along with any conditions that are part of other federal or state water approvals. We conclude that with these measures, along with our additional recommended mitigation measures, impacts on surface waters would be effectively minimized or mitigated, and would be largely temporary in duration. Long-term impacts related to slope instability adjacent to streams have the potential to adversely impact water quality and stream channel geometry, in addition to downstream aquatic biota. Restoration and revegetation of disturbed areas would be completed in accordance with federal and state/commonwealth permits, and the FERC *Plan* and *Procedures*. Post-construction monitoring would also be required to assure successful re-establishment of vegetation and stability of upland soils and slopes that drain to surface waters. At this time, the *COM Plan* is in draft form, and it is unclear if erosion control and rehabilitation measures would meet Forest Plan Standards. Thus, the FS considers final sedimentation effects on water resources to be unknown pending incorporation of necessary mitigation measures as revisions to the *COM Plan*.

5.1.3.3 Wetlands

Wetland surveys have been conducted along approximately 92 percent of the ACP route and 93 percent of the SHP route and at most of the projects' associated and ancillary facilities. Construction of ACP and SHP would temporarily affect 798 acres of wetland and operation would affect 244 acres of wetland. Most impacts would be on forested wetlands, affecting 604 acres and 227 acres during construction and operation, respectively. Construction of new aboveground facilities and new or permanently maintained access roads would impact 6.9 acres for ACP and 0.5 acre for SHP. According to data provided by Atlantic, less than 1.0 acre of emergent, forested, and scrub-shrub wetlands would be temporarily and permanently impacted on federal lands. Atlantic would also cross several sensitive wetland types, including the protection buffer around the Spruce Creek Tributary Conservation Site in Virginia, the

Meherrin River and Fountains Creek wetlands, the Chesapeake wetland mitigation bank, and cypress gum swamps of Virginia and North Carolina.

Construction and operation impacts on wetlands would be mitigated by Atlantic's and DETI's construction and restoration plans and compliance with the USACE section 404 and state permit requirements, including providing in-kind mitigation. As a part of the federal and state permitting processes, written approval of the mitigation plan would be obtained from the USACE and appropriate state agencies prior to construction. Where differences exist in federal, state, and local approaches to determining mitigation ratios, Atlantic and DETI would prepare specific mitigation plans to ensure compliance with the more stringent ratio. Because these mitigation plans have not been finalized we are recommending that Atlantic and DETI should file a copy of the final wetland mitigation plans and documentation of the USACE approval of the plans.

Atlantic and DETI would maintain a 30-foot-wide corridor over the pipeline with selective removal of trees within forested and scrub-shrub wetlands. Additionally, the Atlantic and DETI would mow and maintain a 10-foot-wide corridor centered over the pipeline within wetlands in an herbaceous state. Most of the permanent impacts on wetland vegetation would be in forested wetlands where trees within 15 feet of the pipeline centerline would be selectively cut and removed once every 3 years. Atlantic and DETI would conduct annual post-construction monitoring of wetlands affected by construction to assess the condition of revegetation and the success of restoration until revegetation is successful.

Atlantic and DETI identified site-specific conditions that do not allow for a 50-foot setback of ATWS from wetlands, or where a 75-foot-wide right-of-way is insufficient to accommodate wetland construction, and requested approval to implement alternative measures. Based on our review, we conclude that those requests are justified. However, additional modifications appear to be proposed but have not been identified or justified by Atlantic and DETI. These modifications cannot be deemed acceptable until appropriate justification is provided and we concur with the justification.

Based on Atlantic's and DETI's implementation of proposed construction and restoration plans and efforts to avoid and minimize wetland impacts, we conclude that impacts on wetland resources would be effectively minimized and mitigated. On NFS lands, Atlantic would implement the measures described in the *COM Plan*, which includes additional measures identified in the LRMPs of both national forests. However, the FS has acknowledged that additional standards and guidelines would be necessary on NFS lands, and further revisions to the *COM Plan* are required. Additionally, the FS believes it is unclear if erosion control and rehabilitation measures would meet Forest Plan Standards. Thus, the FS considers effects on wetland resources on NFS lands to be unknown pending incorporation of necessary mitigation measures into the *COM Plan*.

5.1.4 Vegetation

Impacts on vegetation from ACP and SHP would range from short-term to permanent due to the varied amount of time required to reestablish certain community types, maintenance of herbaceous and shrub vegetation within the permanent right-of-way, and conversion of aboveground facility locations and new permanent access roads to non-vegetated areas. Construction of ACP and SHP would affect about 7,509 acres of vegetation, including about 6,137 acres of upland forest vegetation (deciduous, coniferous, and mixed). Operation of ACP and SHP would affect about 3,456 acres of vegetation, including about 2,744 acres of upland forest vegetation (deciduous, coniferous, and mixed). While about 140 acres of grassland/herbaceous and emergent wetlands communities occur within the ACP and SHP permanent rights-of-way, these vegetation communities would be allowed to regenerate following restoration. On federal lands, ACP would temporarily impact about 388 acres of vegetation, including about 103 acres in the MNF, and 285 acres in the GWNF. Operation of ACP on federal land would have long-term impacts on about 179 acres of vegetation, including about 48 acres in the MNF, 131 acres in the GWNF, and 0.5 acre of the BRP.

ACP and SHP would also impact vegetation communities of special concern, including areas of red spruce forest of West Virginia and Virginia; longleaf pine forest and peatland pocosin and canebrake communities of North Carolina; 16 Virginia Natural Heritage Conservation Sites; 12 North Carolina NHNAs, and 9 North Carolina natural communities. While the VDCR has recommended avoidance of all conservation sites crossed, the VDCR has emphasized avoidance of the Handsom-Gum, Branchville, and Emporia Powerline Bog Conservation Sites to conserve documented natural heritage resources. The VDCR requested the Emporia Powerline Bog be completely avoided, potentially by moving the pipeline north of the current crossing beyond the access road area and exploring different alternatives for the crossing of Interstate 95. Atlantic incorporated a minor route modification at the Emporia Powerline Bog site to reduce impacts and avoid direct impact on the rare plant communities; however, complete avoidance was not considered practicable due to the orientation and size of the Conservation Sites. Accordingly, Atlantic made additional efforts to minimize habitat fragmentation by collocating the pipeline adjacent to existing utility rights-of-way at the Handsom-Gum and Branchville Conservation Sites. In a letter to the VDCR dated July 15, 2016, Atlantic proposed avoiding direct impacts on rare plant occurrences and contends that construction of ACP would expand suitable habitat for and encourage the spread of rare plants beyond the existing occurrences with proper management. Atlantic requested concurrence from the VDCR. To date, the VDCR has not provided concurrence with Atlantic's proposed avoidance and minimization concept, and consultations are ongoing.

We received comments from the North Carolina Coastal Land Trust regarding impacts on the Meherrin River Margarettsville Bottomlands Natural Heritage Area. The North Carolina Coastal Land Trust has indicated that the largest know population of Douglass' bittercress (*Cardamine douglassi*), a state threatened species, occurs within the levee and bottomland hardwood forests within the Meherrin River Preserve and has the potential to occur on adjacent lands. Atlantic conducted botanical surveys in North Carolina per the protocols reviewed and approved by the FWS North Carolina Field Office and the NCDNCR; this species was not identified as a target species with the potential to occur in the ACP project area by the agencies, and no individuals were observed within the survey corridor.

We received comments from The Nature Conservancy and affected landowners regarding potential impacts on old growth forests along the ACP and SHP routes. Databases of old growth stands in the states crossed by ACP and SHP are not currently available; therefore, a desktop analysis using 2015 aerial photography and recent satellite photography was completed to calculate the miles, acreages, and sizes of trees to be cleared within the pipeline construction and permanent rights-of-way. In addition, the FS analyzed forest inventory data to determine the impact on "possible old growth" forests from ACP on NFS lands. Based on the desktop analysis, ACP and SHP would cross a total of 361.3 miles of late seral forest (330.5 miles on ACP and 30.8 miles on SHP). A total of 4,914.6 acres of large trees are present within the construction workspace (4,503.9 acres within the ACP construction workspace and 410.7 acres within the SHP workspace), and a total of 2,681.7 acres of large trees are present in the permanent right-of-way (2,495.0 acres within the ACP permanent right-of-way and 186.7 acres within the SHP right-of-way). Atlantic would impact 81.6 acres of possible old growth forest community types on the GWNF. Construction of ACP and SHP would convert mature and/or old growth forests to herbaceous habitat, while the balance of the acres would be converted to an early successional condition. Atlantic and DETI would conduct timber cruises and old growth surveys where requested by the landowner, including NFS lands, prior to construction.

We received comments from the FS that overmature forests containing a high proportion of oak are at risk of oak decline. Oak decline occurs slowly, generally in trees that have been exposed to prolonged stress or advanced age. Removal of trees along the right-of-way may expose already stressed trees to edge effects that could further weaken the trees, making them more likely to be attacked by pests or diseases that would not invade healthy trees. Decline would then occur starting at the ends of branches and progressing downward and inward, including a reduction in radial growth, and eventually resulting in the death of the affected trees (Oak et al., 1986).

We received comments on the draft EIS regarding the difficulty of restoring vegetation in steep slope areas. The steep slope areas are mostly along the ACP route in the Appalachian region of West Virginia and western Virginia, but occasionally in other areas along the rights-of-way. We agree that revegetation in steep slope areas can be problematic. Section 5.6 of Atlantic's and DETI's *Restoration and Rehabilitation Plan* (see appendix F) describes the methods that would be used to establish vegetation in steep slope areas. Fast-growing cool season grasses would be used to help ensure faster soil stabilization. Permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from surface of the rights-of-way, and encourage retention of soils may be used, in addition to additional structural material (e.g., rocky or woody debris) to provide an anchor for revegetation and deposition of soil. In addition to these measures, Atlantic and DETI would develop and implement other site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and restoration of the rights-of-way in steep slope areas. Atlantic and DETI are also developing a BIC Team that would develop standard mitigation designs for steep slopes that are identified as potential hazards on the ACP and SHP.

The WVDOF recommended the use of different seed mixes for areas with slopes greater than and less than 15 percent slopes, and recommended seed mixes include wildlife-friendly forage species (forbs and pollinator species) on the Seneca State Forest. Because these measures have not yet been incorporated into Atlantic's *Restoration and Rehabilitation Plan*, we are recommending that Atlantic file updated revised *Restoration and Rehabilitation Plan* that incorporates the WVDOF recommended mitigation measures and seed mixes for Seneca State Forest.

Multiple invasive species have been identified throughout the ACP and SHP project area. We received numerous comments on the draft EIS requesting that Atlantic and DETI consider an expanded list of invasive plant species recognized by regional or state authorities. While state and regional authorities maintain extensive invasive species lists, not all species on these lists are regulated under state or federal statutes. Atlantic and DETI consulted with state agencies charged with regulating noxious weeds and invasive plant species to identify a total of 55 regulated invasive plant species, including 17 in West Virginia, 9 in Virginia, 16 in North Carolina, and 13 in Pennsylvania. Field surveys along ACP identified eight invasive species in West Virginia and one in North Carolina. Field surveys along SHP identified eight invasive species in West Virginia and one in Pennsylvania. Atlantic and DETI would implement their *Invasive Plant Species Management Plan* to address the spread of invasive plants within the pipeline right-of-way and control invasive populations that might prevent successful revegetation. This management would include construction personnel training, inspecting and washing construction equipment, construction phase mitigation measures, post-construction monitoring, and post-construction management. Atlantic's *COM Plan* (see appendix G) identifies construction procedures and mitigation measures to be implemented on federal lands. Results of the invasive plant species surveys, completed through June 2016, and proposed control measures are included in the *Non-Native Invasive Plant Species Management Plan*, which is included in the *COM Plan*. The FS is reviewing the *Non-Native Invasive Plant Species Management Plan*, and will coordinate with Atlantic on the final plan.

We received comments on the draft EIS expressing concern over aerial spraying of herbicides along the right-of-way. Aerial spraying would not be used for invasive species control along the right-of-way; only hand application methods such as backpack spraying and hand pulling would occur. No spraying or mixing would be allowed within 100 feet of any wetland or waterbody, or within 300 feet of any identified karst feature, except where allowed by state or federal agencies. In addition, herbicides would not be utilized for normal vegetation maintenance. To clarify, we are recommending that Atlantic and DETI provide an updated *Restoration and Rehabilitation Plan* and *Invasive Species Management Plan* that includes stipulates that aerial spraying would not be utilized for invasive species control along the right-of-way; no herbicides would be applied within 25 feet of ESA-listed plant species; no use of herbicides or pesticides would occur within 100 feet of a waterbody or wetland, except where allowed by state or federal agencies; no spraying of insecticides or herbicides would be allowed within the 300-foot karst feature buffer, except where allowed by state or federal agencies; and includes the results of the West Virginia and Virginia Natural Heritage Program recommendations for herbicide treatment adjacent to sensitive features. The FS is reviewing the *COM Plan* (see appendix G), and will coordinate with Atlantic on the final plan.

ACP would cross three vegetation communities of special concern on the GWNF: NFS Road, Windy Cove, and Brown's Pond Special Biological Area (SBA). Brown's Pond SBA is considered a site of Outstanding Significance (B1) and includes Central Appalachian Mountain Ponds, a seasonally flooded sinkhole pond community dominated by three-way sedge (*Dulichium arundinaceum*) and buttonbush (*Cephalanthus occidentalis*). This sinkhole community provides important breeding habitat for amphibians, dragonflies, and damselflies. This community type is known from less than 20 sites in the United States and are threatened by hydrologic disturbance and timber harvests (NatureServe, 2015). Atlantic observed Fraser's marsh St. John's-wort and three birds orchid, which are GWNF locally rare species, during 2015 and 2016 field surveys. Construction would affect 2.2 acres of vegetation for construction related to access road 36-016.AR1 (FR 281/Tower Mtn. Road) and operations would affect 2.2 acres of vegetation. The FS expressed concern regarding several discrepancies in the information provided by Atlantic for the proposed improvements to access road 36-016.AR; specifically, that the existing access road may not be able to accommodate the equipment and the potential for impacts on sensitive resources adjacent to access road 36-016.AR1. Therefore, we are recommending that Atlantic provide detailed mapping of the existing conditions and proposed improvements to access road 36-016.AR1, including digital data, a description of the construction and operation impacts (including impacts on the adjacent vegetation communities, potential pond crossings identified in appendix K, and GWNF locally rare species downslope), and identify the conservation measures that would be implemented to mitigate these potential impacts.

Based on our review of the potential impacts on vegetation, we conclude that the primary impact from construction and operation would be on forested areas crossed by ACP and SHP, including the removal of 6,137 acres of forested vegetation (includes 2,744 acres of permanent impacts) and fragmentation of interior forest blocks. Due to the length of time required to recover forested vegetation, these impacts would be considered long-term to permanent. Atlantic and DETI would reduce these impacts through the implementation of their construction and restoration plans, in addition to our recommendations made throughout this EIS. If approved, Atlantic would maintain a 50-foot-wide permanent right-of-way in upland areas. To minimize forest fragmentation and impacts on scenery, Atlantic and DETI would implement the vegetation maintenance provisions outlined within the FERC *Plan* and *Procedures*. However, despite these efforts, we conclude that forested areas would experience significant impacts as a result of fragmentation and where forest land would convert to herbaceous vegetation in the permanent rights-of-way.

5.1.5 Wildlife

ACP and SHP would impact wildlife species and their habitats. Construction of ACP and SHP facilities would affect about 7,509 acres of wildlife habitat. Of this, about 2,744 acres of upland forested habitat and 398 acres of woody wetland habitat would be permanently converted and maintained in an early successional stage by mowing and periodic tree removal during operations. The impact of ACP and SHP on wildlife species and their habitats would vary depending on the habitat requirements of each species and the existing habitat present within the project area. Direct impacts from construction would include the displacement of wildlife and direct mortality of some individuals, such as incubating birds, their eggs, and nestlings, small mammals, invertebrates, including their eggs and larvae, and slow-moving reptiles and amphibians, including their eggs. Larger or more mobile wildlife, such as adult bats, birds, and large mammals, would leave the vicinity of the right-of-way as construction activities approach. The influx and increased density of animals in nearby undisturbed areas could also reduce the reproductive success of animals that are not displaced by construction, and increase the risk of predation in the area. These effects would diminish after construction, and some wildlife could return to the newly disturbed areas and adjacent, undisturbed habitats after right-of-way restoration is completed and access roads are restored or their use is no longer required. Wildlife populations of some species would return to preconstruction levels only when and if suitable habitat is restored. Destruction of certain habitat types, such as rocky outcrops or vernal pools, which serve as habitat for species with more limited mobility and range, or where species exhibits high site fidelity would be permanently altered, degraded or destroyed, and may permanently displace some wildlife species. Displacement of these individuals could result in decreased fitness and possible mortality.

ACP could impact cave invertebrates and other subterranean obligate species (amphipods, isopods, copepods, flatworms, millipedes, beetles, etc.) that are endemic to only a few known locations. Atlantic conducted karst surveys in Pocahontas and Randolph Counties, West Virginia and Highland, Bath, and Augusta Counties, Virginia in 2016 and 2017. The Final Karst Survey Report identified karst features within these counties; however, due to the underground nature of these systems it is difficult to identify their full extent. Because no additional assessment was made of the karst features to determine whether they are appropriately suitable for any of the cave or subterranean obligate species (except bats), we assume that all karst features may provide suitable habitat for subterranean obligate species and assume presence of these species. Atlantic's *Karst Mitigation Plan* outlines measures to avoid or minimize potential impacts on karst and subterranean habitats. The VDCR-DNH and the Virginia Cave Board have endorsed the revised *Karst Mitigation Plan* as comprehensive and indicate that the measures included would reduce the potential risk posed by ACP to karst resources. However, because subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a), it is possible that construction impacts could have population-level effects on these species.

A variety of migratory bird species, including BCCs, are associated with the habitats that would be affected by ACP and SHP. Atlantic and DETI developed a *Migratory Bird Plan* to minimize breeding and nesting impacts. Atlantic and DETI currently plan to avoid tree clearing during the state-specific migratory bird season, and would implement no-activity buffers around active nests for certain species of raptors and rookeries. Atlantic would maintain its permanent right-of-way according to the FERC *Plan* and *Procedures* (see table 2.3.1-1) and state-specific migratory bird TOYR. Aerial surveys documented three bald eagle nests near the proposed ACP route in Virginia. Atlantic has applied for bald eagle nest disturbance permits and would not construct within the 660-foot nest buffer around Nest IDs BAEA-ACT-01 or BAEA-ACT-06 if the nests are active from approximately December 15 through July 15. Atlantic would also monitor for golden eagles ahead of winter vegetation clearing activities using a qualified biological monitor.

Atlantic conducted pedestrian surveys in February 2017 in West Virginia, Virginia, and North Carolina to investigate bird activity at rookeries identified in previous desktop reviews and aerial surveys. Results of the pedestrian surveys and Atlantic's proposed conservation measures were submitted to the WVDNR, VDGIF, and NCWRC in letters dated April 12, 2017. To date, the WVDNR, VDGIF, and NRWRC have not commented on Atlantic's proposed conservation measures. Therefore, we are recommending that Atlantic provide a final *Migratory Bird Plan* that incorporates the results of consultation with the WVDNR, VDGIF, and NCWRC, and verifies that no additional conservation measures would be required to minimize impacts on active rookeries. In addition, table A-1 of the revised plan should incorporate the NCWRC's recommended updates to the North Carolina BCC list. The revised plan should also include the Virginia Piedmont Forest Block Complex, Allegheny Mountains Forest Block Complex, and the Southern Allegheny Plateau Forest Block Complex IBAs crossed by ACP and SHP in Virginia and West Virginia.

Atlantic has proposed to upgrade existing and build 11 additional communication towers associated with ACP. Migratory birds are known to collide with towers during migration and can become confused or disoriented by lighting, or fly directly into the tower during nighttime migrations. Birds may also use the tower to build nests or as perches, and can be impacted by maintenance activities occurring during operation. Atlantic would adhere to the FWS guidance for "Project Design and Maintenance" reviews of communication towers provided by the Raleigh FWS Office (FWS, 2013c) and the FWS Migratory Bird Office (FWS, 2016o).

Several agencies, including the FWS, FS, and WVDNR, VDEQ, and NCWRC, have expressed concerns regarding forest fragmentation and the impacts on interior forest and their associated wildlife species. In total, ACP and SHP would result in loss of 4,892 acres of interior forest habitat and create 30,025 acres of new forest edge habitat extending 300 feet from the edges of construction workspace. Permanent removal of forest habitat for the operation of ACP and SHP, as well as the time that would be needed for wildlife habitat to recover within the temporary right-of-way, would be long-term to permanent. Construction of SHP would not result in forest fragmentation in Pennsylvania.

The project area has already been fragmented by roads, other utility rights-of-way, residential and commercial development, mining operations, and clear cuts. This is evidenced by the state fragmentation data analysis, which shows approximately 72 percent of the total number of interior forest blocks that would be impacted by ACP are patch and small core interior forest categories. Most of the existing fragmented and isolated interior forest habitat occurs in North Carolina. Approximately 77 percent of the areal coverage impacts associated with forest loss and edge effect would occur in the medium to large core interior forest categories (includes moderate to outstanding Virginia ecological cores), which occurs largely in West Virginia and Virginia. Apart from the direct loss of forest coverage in these medium to large cores, ACP would further contribute to the reduction in fragment area, increased fragment isolation, and increased proportion of edge habitat that would likely result in further degraded ecosystems, reduced species persistence, species richness, nutrient retention, trophic dynamics, and possibly wildlife movement.

The ACP and SHP rights-of-way would be restored and maintained in a vegetated state. Isolation resulting from fragmentation varies by species, but generally occurs at shorter distances for plants (tens to hundreds of meters), invertebrates, amphibians, reptiles, and small mammals (less than 1 km), to large mammals and birds (several kilometers). At its widest, the construction right-of-way would be 125 feet wide through forested communities. Following construction, a 50-foot-wide right-of-way would be maintained in upland areas and a 30-foot-wide area maintained in wetlands. Although we recognize that regeneration of forested habitat would be long term, it is unlikely that the pipeline rights-of-way would serve as a long-term barrier to plant or wildlife movement, except for some sensitive plant species, or wildlife species with very limited mobility.

Edge effects, such as increased predation, changes in microclimate and community structure along the newly formed forest edge, and spread of noxious and invasive species would also have the potential to occur along the construction and operations rights-of-way. Atlantic and DETI would reduce some of these impacts by restoring the rights-of-way following construction according to the FERC *Plan* and *Procedures* (see table 2.3.1-1) and Atlantic's and DETI's *Restoration and Rehabilitation Plan* (appendix F). Atlantic and DETI would also control the spread of noxious and invasive plants along the rights-of-way as described in the *Invasive Plant Species Management Plan* (see table 2.3.1-1).

Construction of ACP and SHP would temporarily impact pollinator habitat (including forests, scrub-shrub, grasslands/herbaceous, barren land, woody wetlands, and emergent wetlands). The temporary loss of this habitat would increase the rates of stress, injury, and mortality experienced by honey bees and other pollinators. Atlantic's and DETI's *Restoration and Rehabilitation Plan* outlines the seed mixes and restoration practices that would be used along the pipeline route, and includes a section on pollinator habitat planting and maintenance. Some seed mixes would incorporate regionally specific and native forb (flowering plant) mixes in its traditionally all-grass seed mixes to provide food and habitat for pollinators and local wildlife species. On NFS lands, Atlantic has committed to continue coordinating with the MNF and GWNF to determine the appropriate seed mixes and applications to promote pollinator species.

We received comments on the draft EIS regarding invasive insect and aquatic species. Specifically, the VDCR identified the emerald ash borer, sirex woodwasp, and red imported fire ant as species of high concern in Virginia, and the VDACS is concerned about the spread of European gypsy moth. To reduce the spread of gypsy moth, wash stations would be placed along the route at the border of Virginia and North Carolina. Additionally, Atlantic is coordinating with the VDACS to conduct specialized gypsy moth training for Atlantic's contractor during construction. Atlantic and DETI would control the potential transport of invasive insect species through adherence to federal and state-specific regulations, including restrictions for the movement of equipment and vegetation to and from counties under state or federal quarantines.

We conclude that constructing and operating ACP and SHP would not significantly affect common wildlife species at range-wide population levels, although local populations could be negatively impacted and/or extirpated. Based on our review of the potential impacts on wildlife habitat, we conclude that the primary impact from construction and operation would be on forested habitats crossed by ACP and SHP, including the removal of 6,137 acres of forested vegetation (includes 2,745 acres of permanent impacts), and fragmentation of interior forest blocks. Fragmentation of forested habitat would make the right-of-way, and the intact forest that it crosses, permanently unsuitable for interior forest-dependent species, but may create new habitat for species that prefer ecological edges. Atlantic and DETI would reduce these impacts through the implementation of their construction and restoration plans, in addition to our recommendations made throughout this EIS; however, due to the length of time required to recover forested habitat, these impacts would be considered long-term to permanent.

In addition, Atlantic has the potential to have significant adverse impacts on subterranean habitat and the species associated with this habitat type. The development of karst features could be initiated by the physical disturbance associated with trenching, blasting, or grading, or by diverting or discharging water into otherwise stable karst features. In addition, the development of karst features along the ground surface greatly increases the susceptibility of underlying aquifers to contamination sources originating at the ground surface. Atlantic's and DETI's *Karst Mitigation Plan* (appendix I) outlines the measures that would be taken to avoid or minimize these potential impacts; however, subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality; therefore, it is possible that impacts associated with construction activities could have population-level effects on these species.

5.1.6 Aquatic Resources

There are 1,556 waterbody crossings on ACP, and 135 waterbody crossings on SHP (some waterbodies are crossed more than once), a number which are classified as warmwater or coldwater fisheries. Several waterbodies that are considered sensitive due to the presence of sensitive aquatic species, such as trout, anadromous fish, or federal or state/commonwealth protected species, would also be crossed. In Virginia, ACP would cross three SCUs: the Nottoway River-Fort Pickett SCU, Nottoway River-Sturgeon Creek SCU, and the Nottoway River-Monroe Bridge SCU. While EFH is present in the South Branch Elizabeth River (AP-3 MP 81.8) and the Nansemond River (AP-3 MP 64.4), these rivers would be crossed using the HDD method; therefore, no adverse impacts on EFH are anticipated and no further consultation is required.

There are 21 waterbody crossings on the MNF, and 36 waterbody crossings on the GWNF. Based on comments submitted on September 1, 2016, from the GWNF, and our recommendations in the draft EIS, Atlantic has eliminated the proposed access road crossing of Laurel Run, and the unnamed tributaries to Laurel Run, which are wild brook trout streams in Bath and Augusta Counties, Virginia. However, in the recent version of the Master Waterbody Crossing Table (appendix K) submitted by Atlantic on May 8, 2017, Atlantic indicates that it would impact 2 ponds near the Brown's Pond SBA. It appears that these crossings may be associated with proposed access road 36-016.AR1. The Brown's Pond SBA is considered a site of Outstanding Significance due to presence of Central Appalachian Mountain Ponds, a rare community type that supports sensitive plant species and serves as important breeding habitat for amphibians and insects. In addition, the information provided by Atlantic to date regarding planned improvements for access road 36-016.AR1 has been inconsistent, and we have recommended that Atlantic provide detailed mapping of the existing conditions and proposed improvements to access road 36-016.AR1, including digital data, a description of the construction and operation impacts (including impacts on the adjacent vegetation communities, potential pond crossings identified in appendix K, and GWNF locally rare species located downslope), and identify the conservation measures that would be implemented to mitigate these potential impacts. Due to the sensitivity of this community, additional consultation with the FS on these pond crossings will be required.

Appendix K describes each waterbody crossing location by ACP and SHP facility type (e.g., access road, temporary or permanent right-of-way, compressor station), approximate milepost, waterbody (feature) name, crossing length, and identifies if blasting or water withdrawal is proposed at that crossing location. During our review of the ACP Master Waterbody Crossing Table (May 8, 2017 version), we noted some discrepancies when compared to other supplemental information provided by Atlantic. In addition, Atlantic has not provided the state/commonwealth regulatory classification for several waterbodies (e.g., "WQS not assessed"), and based on our recent correspondence with the FWS and state agencies, we noted that the TOYR for some waterbodies were incorrect, or conservation measures were incorrect or incomplete. In appendix K, we have provided a "FERC Recommended Conditions" column that identifies the revisions or clarifications needed for each waterbody. Therefore, we are recommending that as part of its Implementation Plan (recommended Environmental Condition No. 6), Atlantic and DETI provide revised Master Waterbody Crossing tables for ACP and SHP that address the recommended conditions the identified column of appendix K. The revised table or accompanying filing should document correspondence and input from the appropriate federal and state agencies regarding the updated and any additional mitigation measures to be incorporated for each waterbody.

Atlantic and DETI would minimize aquatic resource impacts by using the various trenchless or dry crossing methods, extra workspace restrictions, and restoration procedures. Atlantic would implement mussel relocation in West Virginia, Virginia, and North Carolina, and non-mussel aquatic species relocation plans in Virginia and North Carolina that would involve the relocation of aquatic species to suitable habitat outside the work area prior to in-stream construction activities. Atlantic and DETI would also implement measures outlined in their construction and restoration plans such as restoring stream beds and banks to preconstruction conditions and implementing measures to minimize erosion and sediment loads. Adherence to the restoration plans would promote regrowth of riparian vegetation. Where in-stream blasting may occur, Atlantic and DETI would implement their blasting plans that provide measures for minimizing blasting-related fishery impacts. Atlantic and DETI have also committed to adhering to agency-recommended TOYR for all in-stream activities, including water withdrawal to avoid impacts on sensitive aquatic resources, with the following exceptions:

- proposed bridge support installation during the TOYR for Roanoke logperch (ESA- and state-listed species) at Waqua Creek and Sturgeon Creek;

- proposed flume crossing of Sturgeon Creek during the Atlantic pigtoe (ESA under review and state-listed species) and dwarf wedgemussel (ESA- and state-listed species) TOYR; and

- all construction activities where the green floater has been assumed present (ESA under review and state-listed species).

Atlantic has consulted with the FWS regarding the proposed activities at the waterbodies identified above; however, TOYR are enforced by the VDGIF for state-listed species, therefore, we are recommending that Atlantic consult with the VDGIF regarding construction activities proposed during the TOYR for these species in the waterbodies indicated, and file with the Secretary the results of these consultations, along with any additional conservation measures, with Atlantic's Implementation Plan and revised Master Waterbody Crossing table.

Atlantic proposes to use the HDD or conventional bore method (trenchless) at 27 waterbody crossings; DETI would not use the HDD method at any waterbody crossings. These methods would minimize impacts on the streambed, stream banks, and aquatic resources, except in the case of an inadvertent release of drilling mud. As detailed in Atlantic's *HDD Plan*, if drilling mud were released into a waterbody, Atlantic's contractor would take immediate action to control any inadvertent releases, clean up the affected area, and adjust minimize or prevent recurrence. Atlantic and DETI would also use dry crossing methods (flume, dam and pump, or cofferdam) on nearly all remaining stream crossings to minimize potential sedimentation and turbidity impacts.

Atlantic has proposed to use the open-cut method at 91 waterbody crossings. Wet, open-cut construction methods involve trenching within the waterbody under flowing conditions with backfill and restoration occurring quickly (typically within 24 to 48 hours) to limit impacts on the stream. Approximately 25 of these waterbodies have the potential or are known to contain sensitive species; however, surveys are pending at some waterbodies. Depending on the sensitive species potentially present, Atlantic would implement species-specific TOYR (except where noted above), or aquatic species relocation in accordance with federal and state agency mussel relocation protocols, or state non-mussel aquatic species relocation plans. We recommend in section 4.7.1 and appendix K additional conservation measures by waterbody crossing, including the implementation of TOYR, aquatic species relocation, and the FWS' enhanced conservation measures, where appropriate.

In addition to increased sedimentation and turbidity resulting from construction across waterbodies, the FWS and FS have expressed concern with sediment-laden discharge water from nearby access roads that could drain into waterbodies occupied by sensitive species and other aquatic biota. Permanent access roads are proposed across 264 waterbodies on ACP, and there are an additional 10 temporary access road crossings. DETI has proposed permanent access roads across 62 waterbodies on SHP. Approximately 81 percent of the proposed access roads are existing roads that can accommodate construction traffic without modification or improvement. Some access roads, however, are dirt or gravel roads that are not currently suitable for construction traffic. Where necessary, Atlantic and DETI would improve unsuitable dirt and gravel roads through widening and/or grading, installing or replacing culverts, or clearing overhanging vegetation or tree limbs; improvements will be based on need. Widening would generally involve increasing the width of the road up to 25 feet. Where improvements are needed, Atlantic and DETI would install erosion devices in accordance with federal and state permit requirements, and would maintain these devices through the completion of construction. In addition, where culverts require replacement, they would be sized to satisfy simulation design standards to accommodate the passage of aquatic organisms, flows, and other fluvially transported material. Many existing access roads are not designed to these standards so replacement of existing culverts would serve to improve movement of aquatic organisms. Although many of these access roads are existing, it is anticipated that there would be in increase in heavy vehicular and construction equipment traffic during construction that could increase erosion and sedimentation runoff from proposed access roads. Additional erosion control measures would be implemented at access roads at ESA sensitive waterbodies.

Based on FWS and our recommendations in the draft EIS, Atlantic and DETI are proposing to use municipal water sources for all water withdrawals previously planned at ESA sensitive waterbodies except for Jackson River, James River, Appomattox River, Tar River, and Contentnea Creek on ACP, and McElroy Creek on SHP. Water used for dust control would also be appropriated from municipal sources. In addition, water withdrawal is proposed at Jennings Branch and South Fork Rockfish River which are brook trout streams; Back Creek and Calfpasture River where the Virginia SGCN and GWNF RFSS roughhead shiner has been documented; and at Blackwater River which provides migratory fish, spawning, and nursery habitat. Atlantic would adhere to the applicable TOYR for water withdrawal in these waterbodies, as identified in appendix K. Atlantic and DETI would reduce impacts on aquatic resources by adhering to the measures in the FERC *Plan* and *Procedures*, which include the use of mesh screens on intake pumps to reduce the impingement and entrainment of fishes; control of the flow rate to prevent erosion, streambed scour and sedimentation; and maintaining normal waterbody flow during hydrostatic test water withdrawals.

Atlantic prepared a Soil Erosion and Sedimentation Model Report by subwatersheds present within the MNF and GWNF. The model results indicate an annual soil loss ranging from 2.19 to 8.00 tons/acre during the first year of construction, which equates to approximately 200 to 800 percent above baseline erosion rates for the subwatershed (0.4 to 1.33 mm of soil loss). Section 19.0 of Atlantic's *COM Plan* describes the Water Quality Monitoring Plan that would be implemented on NFS lands to monitor and address chronic impacts on water quality according to state numeric water quality standards for turbidity. Atlantic would conduct turbidity measurements at all stream crossings that are state-designated as either CWF or significant coolwater or warmwater fisheries in West Virginia. Waters are not classified as cold or warmwater fisheries in Virginia. The FS would continue to consult with Atlantic to complete the *COM Plan* for construction of ACP on NFS lands, including consultation with the GWNF to determine which categories of the Commonwealth Regulatory Classification should be monitored (e.g., Aquatic Life, Class I-IV trout waters) during construction.

In letters dated February 7, 2017, and February 24, 2017, the VDGIF requested that the *Invasive Species Management Plan* be expanded to include invasive aquatic species recognized by regional (Mid-Atlantic Panel on Aquatic Invasive Species) or state (Virginia Invasive Species Workgroup, VDCR-DNH) authorities, such as zebra mussel (*Dreissena polymorpha*), and that mitigation measures be implemented to address potential transference of these species during water withdrawal and discharge, and on construction equipment and personal vehicles. Atlantic and DETI would conduct mussel relocation survey and efforts in waterbodies in West Virginia, Virginia, and North Carolina, and would conduct general aquatic species relocations in Virginia and North Carolina. Relocation efforts are currently proposed or recommended at a total of 566 waterbodies on ACP and three waterbodies on SHP. During these efforts, qualified biologists would identify collected specimens to the species level, if possible, and relocate individuals per the protocol. To account for the potential capture of invasive species and prevent their relocation, we have recommended that Atlantic and DETI update the *Virginia Fish Relocation Plan*, *Freshwater Mussel Relocation Protocol for ACP in North Carolina*, and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Activities* to include notification to the appropriate federal and/or state agencies should an invasive aquatic species be observed or collected during relocation efforts, and in consultation with the appropriate federal and/or state agency, identify the mitigation measures that would be implemented at the crossing location if invasive aquatic species are observed.

Atlantic and DETI would conduct in-water activities at other waterbodies where relocation efforts are not proposed that would involve the placement of equipment and gear into waterbodies for periods of time, and could serve as means to inadvertently transport aquatic invasive species. To account for the potential transportation of aquatic invasive species between waterbodies, we recommend that Atlantic and DETI consider voluntarily implementing the recommendations in the Mid-Atlantic Panel on Aquatic Invasive Species Field Guide for the prevention of the introduction and spread of aquatic species between each waterbody.

Long-term impacts related to slope instability adjacent to streams have the potential to adversely impact water quality and stream channel geometry, and therefore downstream aquatic biota. While Atlantic and DETI have implemented programs and several mitigation measures to minimize the potential for slope instabilities and landslides, the development of other slope instability/landslide risk reduction measures have not been completed or have not been adopted. Given the impact avoidance, minimization, and mitigation measures proposed by Atlantic and DETI, including their adherence to multiple resource protection plans, aquatic species relocation plans, and adherence to TOYR for in-stream construction activities, along with our recommendations, we conclude that ACP and SHP would result in temporary to long-term impacts, but not result in significant adverse impacts on aquatic resources.

5.1.7 Special Status Species

To comply with section 7 of the ESA, we consulted either directly or indirectly (through Atlantic's and DETI's informal consultation) with the FWS, NMFS, FS, and state resource agencies regarding the presence of ESA-listed, proposed, FS-managed, or state-listed or sensitive species in the project area. The FWS identified 32 ESA-listed threatened or endangered species, 1 proposed species, 1 proposed critical habitat, and 6 species that are currently under review for federal listing that are known to occur in the project areas. Four species were not carried forward for further analysis because they are either not likely to be found in the ACP or SHP project areas, or are listed due to similarities with another listed species (i.e., American alligator). While Atlantic and DETI conducted surveys for several ESA-listed, proposed, or under review species, survey access was not available in all cases. In addition, Atlantic and DETI have not provided conservation measures to address potential impacts on these species in all cases. Therefore, we are recommending that Atlantic and DETI should not begin construction of the proposed facilities until all outstanding biological surveys are completed, the FERC staff have completed any necessary section 7 consultation with the FWS and NMFS, and Atlantic and DETI have received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin.

Based on our consultations, current information, and assuming implementation of our recommendations, we determined that construction and operation of ACP and SHP *may affect* and is *likely to adversely affect* seven ESA-listed species (Indiana bat, northern long-eared bat, Roanoke logperch, Madison Cave isopod, clubshell mussel, running buffalo clover, and small whorled pogonia), and is *not likely to adversely affect, would not jeopardize*, or have *no effect* on the remaining listed or proposed species. In compliance with section 7, we are submitting this EIS, mostly section 4.7.1, as our Biological Assessment and requesting formal consultation with the FWS. We will re-evaluate these determinations with the FWS and NMFS during formal consultation upon receipt of pending survey results and proposed conservation measures.

Atlantic's and DETI's construction and restoration plans include several the measures that would mitigate the potential impacts on vegetation, wildlife, and aquatic species, including ESA-listed, proposed, and under review species and their habitat. Atlantic and DETI have also adopted several additional species-specific conservation measures recommended by the FWS. ESA sensitive waterbodies include those identified in appendix K where ESA-listed, proposed, or under review species have been documented, as well as perennial tributaries to these designated waterbodies within 1 mile of the proposed crossing location where construction activities are also proposed. Atlantic and DETI have committed to implement various measures at ESA sensitive waterbodies to mitigate potential impacts on ESA-listed, proposed, or under review aquatic species. These measures are referred to as the "FWS' enhanced conservation measures." We are recommending that these measures be implemented at several waterbodies identified in appendix K, and recommend that Atlantic limit water withdrawal to not exceed 10 percent of instantaneous flow at ESA sensitive waterbodies.

Atlantic has developed a *Karst Mitigation Plan* (see appendix I) describing the measures that would be taken to avoid or minimize potential impacts on karst resources. The VDCR Division of Natural Heritage (DNH) and Virginia Cave Board have made additional recommendations to address impacts if mitigation and protective measures fail and there is a discharge to karst waters, potentially impacting subsurface habitat, drinking water, and surface streams fed by karst springs. The FWS West Virginia and Virginia Field Offices also continue to express concern regarding the potential for trenching, blasting, and water discharge activities to impact subterranean karst features and karst waters that could indirectly impact bat hibernacula and Madison Cave isopod priority habitat. Atlantic would provide a consolidated report of available literature regarding karst features to FERC and the appropriate federal and state agencies in summer 2017. Atlantic would also perform additional subsurface investigations in 2018 and 2019 to identify and/or verify the locations of voids to supplement mitigation planning once trees have been cleared from the construction right-of-way. Atlantic would perform an ERI survey to detect subsurface solution features along all portions of the route that are mapped as limestone bedrock at the surface prior to construction, which would include surveys of karst features within the Madison Cave isopod priority area (AP-1 MPs 123.7 through 149.6) (see section 4.7.1.13), and karst features within the construction workspace that are within a 5-mile buffer of currently known or survey identified bat hibernacula.

ERI surveys are also planned for the Simmons-Mingo cave system, a known bat hibernaculum in 2019. Surveys of karst features and potential bat hibernacula along the ACP route are not complete. Should these surveys confirm occupancy of bats at potential hibernacula, and/or additional karst features are identified within the construction workspace within 5 miles of known or survey identified bat hibernacula, or within the Madison Cave isopod priority area, we are recommending that <u>prior to construction, but following tree clearing</u>, Atlantic conduct ERI imaging and/or air track drilling surveys of karst features identified within the construction workspace that are within 5 miles of known or survey identified bat hibernacula, and within the Madison Cave isopod priority area, based on the results of the pending 2017 karst and hibernacula surveys. Atlantic should file a report(s) documenting these surveys with the Secretary, and the appropriate federal and state agencies. Based on the ERI imaging and/or air track drilling surveys, if data suggest that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula and/or the Madison Cave isopod suitable habitat, Atlantic should consult with the FERC, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on these species and their habitat.

Total acreage of potential northern long-eared bat occupied and suitable habitat that would be affected by construction is pending completion of 2017 surveys. Therefore, we are recommending that upon completion of 2017 surveys and prior to construction, Atlantic and DETI should file with the Secretary and FWS the total acreages of northern long-eared bat occupied habitat that would be impacted by ACP and SHP; and northern long-eared suitable habitat that would be impacted by ACP and SHP.

Forested habitat along the ACP route in North Carolina has already been fragmented and isolated; therefore, additional impacts from construction of ACP on these fragmented landscapes would contribute to further degradation of available wildlife habitat. In addition, both the FWS and NCWRC have recommended replanting of long-leaf pine to mitigate impacts on the red-cockaded woodpecker. Therefore, we are recommending that following construction, Atlantic replant long-leaf pine within the ATWS and the temporary right-of-way along the ACP route where it was cleared for construction. Based on Atlantic's May 1, 2017 supplemental filing, long-leaf pine-wire grass communities occur between AP-2 MPs 156.5 and 156.9.

Atlantic has proposed utilizing the cofferdam method to cross the Neuse River. The Atlantic and shortnose sturgeons, Atlantic sturgeon PCH, and several ESA under review and state-listed species have either been confirmed or have the potential to occur within the Neuse River. In addition, the Roanoke logperch, and other ESA-listed species, have the potential to occur at Nottoway River (AP-1 MP 260.7). Due to the number of sensitive aquatic species and habitat that have the potential to occur during construction activities at these waterbodies, we are recommending that Atlantic submit a hydrofracture potential analysis for these waterbodies, and if the potential for hydrofracture is low, utilize the HDD method at these crossings. If the HDD method is not feasible, Atlantic should consult with the FWS and the appropriate state agency to identify additional conservation measures that would be recommended at these crossings to mitigate for the potential impacts on these sensitive species impacts.

Carolina madtom surveys are pending at five sites at Beaverdam Swamp, Jacket Swamp, Sapony Creek, an unnamed tributary of Little Sapony Creek, and John K. Swamp; these surveys are anticipated to be completed by July 2017. The FWS has indicated that Neuse River waterdog and Carolina madtom use similar habitats; however, Atlantic's January 27, 2017 BA identifies waterbodies that provide suitable habitat for Neuse River waterdog, but unsuitable habitat for Carolina madtom (see appendix K). Furthermore, the FWS has indicated that the Carolina madtom has low detectability (less than 20 percent) during individual surveys. Therefore, we have recommended that Atlantic implement the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities*, as well as the FWS' enhanced conservation measures for ESA sensitive waterbodies defined in section 4.7.1 where Carolina madtom presence is assumed based on survey results and consultations with the FWS North Carolina Field Office.

The candy darter is not currently listed under the ESA. It was petitioned for listing in April 2010; the FWS determined the petition had substantial information and may be warranted for listing, and initiated a status review in September 2011. The candy darter is also an MNF RFSS and priority 1 SGCN in West Virginia. The candy darter has a documented distribution within the upstream reaches of the mainstem of the Greenbrier River and its tributaries. It has recently been documented in Knapp and Sitlington Creeks. During habitat assessments, Atlantic identified potentially suitable habitat for this species within Clover Creek, Glade Run, Thomas Creek, and Knapp Creek. Based on documented occurrence information, and Atlantic's habitat assessment for the candy darter, we have recommended that, if the candy darter is proposed or listed during the life of the project, Atlantic should assume presence of the candy darter within Knapp Creek, Clover Creek, Glade Run, Thomas Creek, and the Greenbrier River, and apply the FWS' enhanced conservation measures for aquatic species outlined in section 4.7.1 to these waterbodies and any perennial tributaries within 1 mile of these crossing locations to minimize impacts on this species (see appendix K).

Regarding species protected under the MMPA, two species of marine mammals may be present in the ACP project area in the Nansemond, James, and South Branch Elizabeth Rivers: bottlenose dolphin and harbor seal. No species of marine mammals are present in the SHP project area. There is a low likely hood that marine mammals would be present at these waterbodies during the time of construction. Atlantic would cross these waterbodies using the HDD method, avoiding direct impacts on the waterbodies. Effects on marine mammals resulting from water withdrawals would also be unlikely because water intakes would be screened to avoid entrainment or impingement of aquatic species. As such, ACP would not result in harassment of marine mammals and thus would not require an Incidental Take Authorization or *Marine Mammal Monitoring Plan* under the MMPA.

Atlantic prepared a draft BE to assess impacts on RFSS on NFS lands, which is currently under review by the MNF and GWNF. Surveys are ongoing, and an effects determination for RFSS will be reflected in the FS' Final ROD. This EIS evaluates impacts on MNF and GWNF MIS, and to GWNF locally rare species. To minimize impacts on these species, Atlantic would implement the *COM Plan* (see appendix G), which will describe the avoidance and minimization measures that would be implemented during construction and operation activities on NFS lands. These measures may reduce potential impacts on certain FS-managed species to varying extents. However, these measures are not intended to achieve site-specific avoidance and minimization impacts of known species occurrences and habitat features that fall within or near the proposed construction footprint. The FS has indicated that additional measures are needed to achieve required avoidance and minimization impacts and be consistent with MNF LRMP Standard WF13 and VE13.

ACP and SHP also have the potential to impact several state-listed or sensitive species. West Virginia does not have state threatened or endangered species legislation, but assigns State Ranks to rare species. As of May 2017, there are 866 acres of pending biological surveys in West Virginia on ACP, including surveys for bats, plants, and timber rattlesnakes. There are an additional 50.1 acres of pending biological surveys for plants and bats on SHP. Surveys are anticipated to be completed in 2017. Atlantic and DETI are currently working with the WVDNR to identify conservation measures for these species.

The Virginia Endangered Species Act designates the VDGIF as the agency responsible for managing Commonwealth fish and wildlife species, and the VDCR as managing Commonwealth plant and insect species. As of May 2017, approximately 1,349 acres and 98 sites have not been surveyed for biological resources in Virginia; this include surveys for bats, small mammals, tiger salamanders, Mabee's salamanders, Roanoke logperch, freshwater mussels, GWNF RFSS insects, and plants. These surveys are expected to be completed in 2017. Atlantic are currently working with the VDGIF and VDCR to identify conservation measures for these species.

To minimize in-stream and water withdrawal impacts on the green floater, we have recommended in appendix K that Atlantic implement the VDGIF TOYR from April 15 to June 15 and August 15 to September 30 in all waterbodies where the green floater has been assumed present in Virginia, and intermittent and perennial tributaries within 1 river mile of these waterbodies. In addition, we have recommended that Atlantic consult with the VDGIF regarding in-stream construction activities during the VDGIF's TOYR for Atlantic pigtoe (May 15 to July 31) and for dwarf wedgemussel (March 15 to July 31 and August 15 to October 15), and include any additional conservation measures required by the VDGIF in its Implementation Plan and ACP Master Waterbody Crossing table.

In North Carolina, the NCWRC is responsible for managing fish and wildlife listed and special concern species, and the North Carolina Department of Agriculture is responsible for managing plant and insect species. As of May 2017, approximately 74.5 acres have not been surveyed for biological resources in North Carolina; this includes surveys for bats, plants, Carolina madtom, Neuse River waterdog, North Carolina spiny crayfish, and mussels. These surveys are anticipated to be completed in 2017. Atlantic are currently working with the NCWRC and NCDNCR to identify conservation measures for these species.

5.1.8 Land Use, Recreation, Special Interest Areas, and Visual Resources

Constructing ACP and SHP would affect about 11,776 acres of land, and operating the proposed facilities would affect about 4,930 acres of land. Of this total, about 112 acres would be affected on the MNF during construction and 56 acres during operation, and about 318 acres would be affected on the GWNF during and construction and 158 acres during operation. The new pipelines would require a 50-foot-wide permanent right-of-way. To facilitate pipeline inspection, operation, and maintenance, the entire permanent right-of-way in upland areas would be maintained in an herbaceous/scrub-shrub vegetated state.

This maintained right-of-way would be mowed no more than once every 3 years, but a 10-foot-wide strip centered over the pipelines may be more frequently to facilitate operational surveys.

ACP would cross two tracts of land supporting specialty crops; and lands enrolled in NRCS and FSA Programs, Virginia Century Farm Program, and Agricultural and Forestal Districts. Atlantic adjusted its workspace to avoid impacts on specialty crops and would continue to coordinate with landowners to avoid and minimize the landowners' participation in these programs. Where impacts on crops and program lands cannot be avoided, Atlantic and DETI would compensate landowners for any project-related damages. In addition, ACP would cross two known certified organic farms and two organically managed, but not certified farms. ACP committed to developing a site-specific *Organic Farm Protection Plan* for each crossing; however, these plans have not yet been filed. Therefore, we have recommended that Atlantic file a site-specific *Organic Farm Protection Plan* for the certified organic farms affected by the projects, including (but not limited to) the milk and corn farm crossed between AP-1 MPs 141.8 and 142.4 and the certified organic hog farm crossed between AP-2 MPs 118.8 and 118.9; and any additional certified organic farms not previously identified, prior to construction.

Several areas where timber is managed and harvested would be crossed by the projects, including the MNF and GWNF. To reduce project-related impacts on merchantable timber suitable for timber production, Atlantic and DETI would implement their *Timber Removal Plan*. Based on comments received on the draft EIS from the VDEQ and changes to the project schedule, we are recommending that Atlantic file a final *Timber Removal Plan* prior to construction that incorporates the VDEQ's recommendations, an updated construction schedule, and updates to all TOYR related to migratory birds and special status species for tree clearing. In addition, Atlantic and DETI would conduct timber cruises prior to vegetation clearing to determine timber volumes, values, and species composition within forested lands, and, in consultation with the land-management agency and landowner, develop site-specific *Timber Extraction Plans* for each area with merchantable timber to be logged. Because timber cruises are pending, we have recommended that Atlantic and DETI file their finalized site-specific *Timber Extraction Plans* prior to construction.

In response to comments on the draft EIS regarding access roads, we recommend that Atlantic file a copy of its referenced *Haul Plan*, which would supplement its *Traffic and Transportation Plan*, and address transportation of equipment, materials, and personnel along narrow public roads in steep terrain.

Atlantic's and DETI's proposed construction work areas are within 50 feet of 82 residential structures. Atlantic and DETI prepared site-specific residential construction plans to address impacts for residences within 50 feet of construction workspace. We reviewed these plans and find them acceptable. However, one site-specific residential plan has not yet been filed and we are recommending that Atlantic file it, and any additional plans for residences within 50 feet of the construction work areas identified after issuance of the draft EIS, with its Implementation Plan. Atlantic and DETI have also developed plans that identify how stakeholders can contract project representatives with questions, concerns, and complaints prior to, during, and after construction. We have reviewed these plans and processes and find them acceptable.

Eleven known planned developments in various stages of development were identified within 0.25 mile of ACP; no known planned developments are within 0.25 mile of SHP. In response to comments on the draft EIS, additional information provided on one of these developments, the Spruce Creek Resort and Market, is included in the final EIS. Atlantic committed to work with individual affected landowners and developers to minimize impacts on the planned developments. Further, Atlantic would obtain the appropriate state or county permits (rezoning, development plan, etc.), and would either purchase the property or negotiate an easement from the current landowner to construct and operate the proposed facilities. Atlantic and DETI incorporated several route variations into their pipeline routes to minimize or avoid impacts on planned developments. In addition to implementation of Atlantic's and DETI's general construction impact minimization methods, Atlantic and DETI attempted to route the pipeline along property boundaries to minimize potential impacts on existing and planned residential developments.

In general, impacts on recreational and special interest areas would be temporary and limited to the period of active construction, which typically would last only several days to several weeks in any one area, except for linear trails where a detour or temporary closure may be required. Site-specific crossing plans for these areas were provided in response to our recommendation in the draft EIS and are included as appendix J of the final EIS.

The removal of trees would result in a long-term impact at temporary workspace areas and a permanent impact within the operational right-of-way. We believe project-related impacts within an area specifically created to manage forest land and valued for its forest land can be reduced. Therefore, we are recommending that Atlantic identify by milepost the locations where a narrowed construction right-of-way would be adopted to reduce impacts on forest land within the Seneca State Forest, MNF, and/or GWNF.

In response to our recommendation in the draft EIS, Atlantic provided documentation from the U.S. Department of the Army that states the ACP is compatible with the purposes of the Fort Pickett Army Base. Atlantic also stated it has secured an easement from the WBWF and would implement any specific construction, restoration, and/or operation mitigation measures identified by the WBWF in these easement agreements.

Portions of ACP in Virginia would be within a designated coastal zone. While Atlantic submitted its Consistency Certification to the VDEQ in September 2015, concurrence of coastal zone consistency is pending. Therefore, we are recommending that Atlantic file documentation of concurrence from the VDEQ that ACP is consistent with the CZMA prior to construction.

One contaminated site, the Borden Smith Douglass Site, would be crossed by the AP-3 Lateral. The site is classified as a Brownfield site based on a review of CERCLIS and ACRES databases and is currently undergoing final site closure within the VDEQ VRP. Based on Atlantic's correspondence with the VDEQ, installation of ACP would not preclude final site closure efforts and would not lead to the spread of contaminated material during construction provided construction is completed in accordance with the SOP. Should contaminated media (i.e., soil or groundwater) be encountered during construction, Atlantic and DETI would implement its *Contaminated Media Plan* to control and contain the material. In response to comments on the draft EIS from the VDEQ, we are recommending that prior to construction Atlantic file a revised *Contaminated Media Plan* that incorporates the VDEQ's recommendations.

Visual resources along the pipeline route are a function of geology, climate, and historical processes, and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. Temporary visual impacts from ACP and SHP would result from the construction and clearing of the pipeline right-of-way, ATWS, pipe storage and contractor yards, and project access roads. Where existing and proposed rights-of-way would overlap, the removal of additional vegetation and disturbance of soils would be minimized compared to construction in greenfield areas. Collocation and construction of the pipeline would be consistent with the existing visual conditions in these areas and not contribute to additional significant visual impacts. Pipeline construction would result in a greater degree of visual impacts in heavily forested areas with high elevations and along steep mountainsides. In West Virginia and northwestern Virginia, portions of the AP-1 mainline would be constructed in steep, mountainous terrain and require the removal of trees. Restoration and the establishment of vegetation in these areas typically takes several years to decades and re-planting trees in the right-of-way would be prohibited due to operational and safety concerns. The cleared and maintained permanent right-of-way in heavily forested areas would create a visual contrast more noticeable to viewers and result in a greater degree of visual impacts. Most heavily forested areas associated with the project are in remote, less populated areas and views of the cleared right-of-way would be intermittent.

In general, the impacts on visual resources resulting from the construction and operation of the MLVs and pig launchers/receivers would be minimal as each site is small and would be operated within the pipeline operational right-of-way, and/or within a larger aboveground facility. Construction and operation of compressor stations and M&R stations would result in a greater impact on the visual landscape, resulting in conversion of about 130 acres of land to a commercial/industrial facility. Most compressor stations would be visually screened from nearby residences or roadways, located within previously disturbed areas, located within areas with consistent industrial/commercial qualities, and/or located more than 1,000 feet from a residence. We anticipate that visual impacts on nearby visual receptors during operation would be permanent, but negligible.

Comments on the draft EIS noted that light pollution resulting from the HDD of the BRP and ANST would affect visitors to the Fenton Inn. Night-time lighting would be required as HDD activities would continue for 24 hours a day, 7 days a week during the 12- to 14-month HDD installation period. Therefore, we are recommending that prior to construction Atlantic identify mitigation measures to reduce impacts on the Fenton Inn resulting from lighting needed to support the BRP and ANST HDD.

ACP would cross scenic byways where mitigation for clearing the construction and operational right-of-way would be determined on a site-specific basis, depending on the assessment of the feature and the expected level of permanent visual impact that may result from tree removal for construction and operation of the pipeline facilities. Atlantic committed to consulting with state and local agencies regarding the appropriate mitigation measures to be implemented at roadway crossings; however, this information is pending. Therefore, we are recommending that Atlantic file site-specific visual mitigation measures for each scenic byway developed in consultation with the appropriate federal, state, or local agency.

On NFS lands, Atlantic conducted a draft Visual Impact Assessment. The draft Visual Impact Assessment analyzes the project's impacts on the scenic classifications based on KOPs identified on the MNF and GWNF. It also includes visual simulations from KOPs on the eastern and western side of the ANST and BRP crossing to determine if the pipeline right-of-way required for the direct pipe option would be visible. A revised draft Visual Impact Assessment also includes additional KOPs identified by the forests, NPS, and ATC in response to comments. The Visual Impact Assessment has not been finalized as of the issuance of this final EIS. Once the Visual Impact Assessment is completed, the FS would work with Atlantic to incorporate any mitigation measures that may be needed to ensure consistency with LRMPs into the *COM Plan* or Special Use Permit (SUP) for NFS lands. Consultations with the MNF, GWNF, and ATC are ongoing.

Atlantic is currently identifying areas of ecologically sensitive areas crossed by the proposed AP-1 mainline within the MNF and GWNF where the construction right-of-way can be narrowed from 125 feet to 75 feet. Atlantic is working with the MNF and GWNF to identify locations where a narrowed right-of-way may be adopted and where corresponding ATWS on each side of the narrowed section would be located. Because information regarding a reduced construction right-of-way and an additional 25 feet of ATWS has not yet been provided, we are recommending that prior to construction Atlantic file the locations where a narrowed right-of-way would be adopted to reduce impacts on forest land and ecologically sensitive areas and updated construction impacts information for all applicable resources affected by these changes. In addition, in response to comments on the draft EIS, Atlantic identified locations where an additional 25 feet of ATWS would be required on FS lands to accommodate the topsoil created by full topsoil stripping; this information is included in the final EIS.

Specific to NFS lands, the NFMA requires that proposed projects, including third-party proposals subject to permits or rights-of-way, be consistent with the *LRMPs* of the administrative unit where the project would occur. The linear nature of the pipeline corridor and the topography of the MNF and GWNF make it difficult to avoid every circumstance that would be inconsistent with the management direction and standards in the LRMPs. The FS determined that if the SUP would be approved for the proposed route crossing the MNF and GWNF, the *LRMPs* would require amendments, which are described in detail. These amendments would not change FS requirements for other projects or authorize any other actions.

Atlantic would cross the several trails and roads on the GWNF using the conventional construction method. As a result, these crossings would require temporary trail and road closures, which would impact recreational and FS users' experience of these trails and roads. While Atlantic identifies some measures that would be implemented as part of its Public Access Plan (part of the draft *COM Plan*), site-specific mitigation measures such as a detour have not yet been identified. In response to our recommendation in the draft EIS, Atlantic provided additional justification for why a bore or HDD crossing method would not be feasible for all trails and roads on the GWNF. However, due to conflicting information provided by Atlantic, we are recommending that, prior to construction, Atlantic clarify the crossing method that would be implemented at each trail, road, and railroad crossing on the GWNF. Further, if a bore or HDD crossing is not feasible, we are recommending that prior to construction Atlantic file a site-specific crossing plan that identifies the location(s) of a detour, public notification, signage, and consideration of avoiding days of peak usage for each trail and road affected by ACP. These plans should be developed in consultation with GWNF staff.

Atlantic would cross the ANST and BRP using the HDD method, which would not require ground disturbance or vegetation clearing between the two HDD entry points, and would avoid direct impacts on recreationalists' use of the trail and parkway. In the event the HDD crossing fails, Atlantic developed a contingency plan for crossing the BRP and ANST, which involves the use of the direct pipe method to complete the crossing. We have reviewed Atlantic's *Blue Ridge Parkway and Appalachian National Scenic Trail Contingency Plan* and find it acceptable. The FS stated it believes the HDD would be feasible as proposed by Atlantic and the direct pipe option would be a feasible contingency option, and that it has no further questions or requests for information regarding the crossing methods. However, comments from the NPS have not yet been received. Therefore, we are recommending that Atlantic should provide documentation that both plans (HDD crossing plan and an alternative direct pipe crossing plan for the BRP) have been reviewed and approved by the NPS.

With adherence to Atlantic's and DETI's proposed impact avoidance, minimization, and mitigation plans, and our recommendations, we conclude that overall impacts on land use, recreation and special interest areas, and visual resources would be adequately minimized.

5.1.9 Socioeconomics

Construction of ACP and SHP would not have a significant adverse impact on local populations, housing, employment, or the provision of community services. There would be temporary increases in housing such as hotels, motels, and other rental units due to the influx of construction workers, and temporary increase in demand for local public services, such as police to direct traffic during construction, or to respond to emergencies associated with pipeline construction. Also, traffic levels would temporarily increase due to the commuting of the construction workforce to the area of the project as well as the movement of construction vehicles and delivery of equipment and materials to the construction right-of-way.

We received comments regarding the potential for negative effects on natural resources and the environment from construction and operation of ACP and SHP to negatively affect tourism, particularly in the Rockfish Valley Wintergreen areas in Nelson County, Virginia, Yogaville in Buckingham County, Virginia, and Pocahontas County, West Virginia. Scenic travelers and tourists in each state crossed by the projects would experience temporary visual and noise impacts associated with construction personnel and equipment and vegetation removal associated with construction workspaces. Atlantic would coordinate with Rockfish Valley and Wintergreen area businesses and recreational stewards to inform them of construction schedules and traffic volumes and would, to the extent practicable, schedule construction activities to avoid conflicts with special events. Yogaville is over 4 miles from the proposed Compressor Station 2, and the Light of the Truth Universal Shrine at Yogaville is 1 mile from the proposed ACP route alignment and over 1 mile from the nearest proposed HDD location. We conclude that the project locations are sufficiently distant from the Yogaville properties so that people enjoying the peaceful and serene environment would not be disturbed by project construction or operation. Therefore, we conclude no direct or indirect impacts on tourism and visitation to Yogaville would result from construction and operation of the projects.

We received several comments on the draft EIS regarding traffic impacts on existing narrow, single-lane, unpaved roads that have been identified by Atlantic as access roads for use during construction in areas of West Virginia and Virginia. Commenters are concerned that added construction traffic (e.g., worker trips and large equipment and material delivery) would cause dangerous conditions and extensive damage. We acknowledge there may be temporary construction impacts on residences and businesses along these more narrow, rural access roads. Impacts may include inconveniences caused by noise and dust, disruption to access of home and businesses, and traffic congestion, and damage to the roadways themselves. Atlantic and DETI would prepare spread-specific traffic and transportation management plans for managing vehicle traffic during construction of the projects to mitigate and minimize impacts. In addition, Atlantic and DETI would repair any damages to roadway surfaces as required in the FERC *Plan*.

We received comments regarding the potential effect of ACP and SHP on property values. We assessed available studies regarding property values and based on the research reviewed, we find no conclusive evidence indicating that natural gas pipeline easements or compressor stations would have a significant negative impact on property values, although this is not to say that any one property may or may not experience an impact on property value for either the short or long term. One compressor station study concluded that “well designed and operated compressor stations located on larger sites with adequate buffers should have minimal impact on surround land uses and residential property values.” Also, the effect that a pipeline easement may have on property value is a damage-related issue that would be negotiated between the parties during the easement acquisition process.

We received comments on the draft EIS from several local business owners concerned that construction of ACP and SHP would negatively impact their businesses and may, in some instances force them to close. We acknowledge that businesses may be directly and indirectly impacted by the projects; however, overall construction of ACP and SHP would benefit state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables and project-specific materials, and sales tax. The long-term socioeconomic effect of the projects during operation is also likely to be beneficial, based on the increase in tax revenues that would accrue in the affected communities and jurisdictions; however, these benefits would not be as significant as during construction.

We also received comments that the project would delay or potentially prevent two large projects from being developed in the Rockfish Valley area: a luxury hotel at Wintergreen Resort and the Spruce Creek Resort and Market, a proposed five-star destination resort, hotel, restaurant, and public market. Based on information provided by Wintergreen Property Owners Association Inc. and Wintergreen Resort Inc., the proposed hotel would be located over 1 mile east of the project. According to developers, the proposed development is estimated to produce $15 million to $20 million in annual revenue. Based on information provided by the developer, the AP-1 mainline would cross the Spruce Creek Resort and Market in Nelson County, Virginia. Specifically, the developer is concerned that the project would cross the middle of the property, eliminating the attractiveness of the resort area and, thus, development of the resort would be stopped. We believe that construction of ACP and development of the hotel at Wintergreen Resort and the development of Spruce Creek Resort and Market could be accomplished such that impacts associated with ACP are reduced or mitigated for, while maintaining the appeal of the area, as demonstrated by other residential and commercial developments in the area and similar projects throughout the country.

We received numerous comments on the draft EIS expressing concern about minority and low-income communities near the proposed Compressor Station 2 in Buckingham County, Virginia. We determined that Compressor Station 2 would be within a census tract that is designated a low-income environmental justice population. The two other census tracts within 1 mile of the proposed Compressor Station 2 are also designated low-income environmental justice populations. None of the three census tracts within 1 mile of the proposed Compressor Station 2 are designated minority environmental justice populations. The nearest residence to the proposed Compressor Station 2 is approximately 1,450 feet from the site.

Due to the number of comments we received regarding environmental justice, and specifically impacts resulting from increased air and noise emissions at the proposed Compressor Station 2, we have expanded our discussion of the potential for the risk of impacts to fall disproportionately on environmental justice communities.

Air pollutants associated with ACP and SHP include increased dust as a result of construction equipment and vehicles, and compressor station emissions, which include carbon monoxide (CO), carbon dioxide (CO_2), methane, and nitrous oxide (NO_x); volatile organic compounds (VOCs); and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$). These air pollutants are known to increase the effects of asthma[1] and may increase the risk of lung cancer. When considering the health impacts associated with compressor station emissions, increased rates of lung cancer were identified associated with the compounds emitted by compressor station operations (Nafstad et al., 2003). Studies have shown that several different cancer-related compounds and chemicals are present in the air in proximity to construction and operation of compressor stations, and that some of these have documented health effects on the general and vulnerable populations (Southwest Pennsylvania Environmental Health Project, 2015).

Due to high rates of asthma within the African American community, we consider this community especially sensitive. Thus, it is reasonable to assume that, where African American populations exceed the thresholds for environmental justice populations identified in this analysis, those populations have an increased risk over Caucasian populations (and therefore disproportionate) of experiencing adverse effects from decreased air quality. Further, it is recognized that low income populations have greater risks associated with negative health outcomes (CDC, 2017).

Due to construction dust and compressor station emissions, African American populations near ACP and SHP could experience disproportionate impacts due to their susceptibility to asthma. Impacts from construction dust would be minor as they would be temporary and localized. Further, Atlantic and DETI would implement measures from their *Fugitive Dust Control and Mitigation Plan* to limit fugitive

[1] Asthma is a chronic disorder impacting the lung airways where periods of reversible airflow obstruction is experienced. Individuals experience asthma “episodes” or “attacks” from a variety of events including exercise, airway infections, airborne allergens, occupational exposures, and air pollutions such as particulate matter and volatile organic compounds. Asthma is incurable but controllable though appropriate medical care with medication and avoiding exposures to triggers for attacks (CDC, 2013).

dust emissions. Impacts from compressor station emissions would be moderate because, while they would be permanent facilities, air emissions would not exceed regulatory permittable levels. As a result, no disproportionately high and adverse impacts on environmental justice populations as a result of air quality impacts, including impacts associated with the proposed Compressor Station 2, would be expected as a result of ACP and SHP. Also, no disproportionately high and adverse impacts on environmental justice populations as a result of other resources impacts would be expected.

Based on the analysis presented, we conclude that ACP and SHP would not have a significant adverse impact on the socioeconomic conditions of the project area.

5.1.10 Cultural Resources

Atlantic and DETI conducted archival research and field surveys to identify historic resources and locations for additional subsurface testing in areas with potential for prehistoric and historic archaeological sites. Atlantic has completed cultural resources surveys of approximately 94.5 percent of the proposed project facilities, leaving or 5.5 percent of the project workspace remaining to be surveyed due to landowner access denials. DETI has surveyed 99 percent of the APE for SHP facilities.

To date, Atlantic identified 198 archaeological and historic sites within the APE for ACP that are listed in the NRHP, eligible for listing, are unevaluated, or would otherwise require treatment during construction (e.g., cemetery avoidance plans for cemeteries that are not eligible for listing). SHPO concurrence with these recommendations are pending on most of these sites. Atlantic would avoid impacts on eligible or unevaluated cultural sites by project design, or would conduct additional studies to further assess NRHP eligibility. On the MNF, Atlantic located one previously recorded archaeological site within the APE and recorded five new sites, all of which are recommended as not eligible for listing on the NRHP. Atlantic conducted additional surveys on the MNF in 2017 and would provide a report documenting the results of the surveys to the MNF when they are complete. On the GWNF, Atlantic recorded 11 sites, including 7 prehistoric archaeological sites, 3 historic sites, and 1 site with both prehistoric and historic components. Eligibility determinations and treatment recommendations are ongoing and pending FS comments on Atlantic's cultural resources survey reports. In addition, Atlantic has not yet provided survey results of recently identified topsoil segregation ATWS on NFS lands.

To date, DETI identified two cultural resources sites that are recommended as eligible and would be avoided or mitigated during construction; one historic farmstead that is recommended as eligible, but would not be affected by SHP; and three historic cemeteries that are recommended not eligible, but would be avoided during construction.

ACP would cross the NRHP-eligible BRP for 0.1 mile at the border between Augusta and Nelson Counties, Virginia. No cultural sites were identified during surveys and Atlantic would install the pipeline beneath the BRP using the HDD method or direct pipe method; therefore, Atlantic recommends that there would be no direct effects on the BRP. The NPS commented that they were satisfied with the report's findings.

We received numerous comments about possible project impacts on several historic districts, including the Warminster Rural Historic District located in Nelson County, Virginia and determined eligible for listing on the NRHP in 2015; the South Rockfish Rural Historic District, also in Nelson County, Virginia and determined eligible for NRHP listing by the VDHR; and the Sunray Agricultural Historic District located within the City of Chesapeake, Virginia and listed on the NRHP in 2007. The pipeline corridor would cross 2.25 miles of the Warminster Historic District and the midsection of the South Rockfish Rural Historic District and may affect individual properties that are eligible or listed in the NRHP. The project would cross the Sunray Agricultural Historic District at one location, a proposed access road that traverses historic site 131-5325-0063. Atlantic has committed to assess potential effects of ACP on the historic districts, consult with the VDHR as needed, and make recommendations for further evaluation or mitigation of adverse effects.

We received numerous comments regarding possible historic burials or cemeteries within the APE in West Virginia and Virginia. Atlantic would be required to complete surveys and evaluate the significance of cultural sites within the APE prior to construction. Atlantic has committed to avoiding effects on cemeteries and burials. Atlantic would conduct additional pedestrian reconnaissance using pedestrian survey, and probing using metal rods to identify any additional burials outside the known cemetery boundaries. Atlantic would avoid cemeteries and burials with an appropriate buffer during construction, and would file treatment plans identifying methods (e.g., fencing, vegetation buffers) to avoid impacts on cemeteries during construction.

We, as well as Atlantic and DETI, consulted with 15 federally recognized Native American tribes to provide them an opportunity to comment on ACP and SHP. Several tribes and organizations requested additional information, and we have responded to tribes that commented on the project. Atlantic and DETI have prepared plans to be used in the event any unanticipated archaeological sites or human remains are encountered during construction. The plans provide for work stoppage and the notification of interested parties, including Indian tribes, in the event of discovery.

To date, archaeological and historic architectural surveys have not yet been completed for the ACP and SHP routes. To ensure that our responsibilities under section 106 of the NHPA are met, we are recommending that Atlantic and DETI not begin construction until any additional required surveys are completed; that survey reports, special studies, evaluation reports and treatment plans have been reviewed by the appropriate parties; and we provide written notification to proceed. In addition, we are recommending that Atlantic file revised *Unanticipated Discovery Plans* that include tribal contact information for those tribes that request to be notified following post-review discovery of archaeological sites, and documentation of communication with the Lumbee Nation, the Coharie Tribal Council, Haliwa-Saponi Tribe, and the Meherrin Tribe. The studies and impact avoidance, minimization, and measures proposed by Atlantic and DETI, and our review and recommendations, would ensure that historic properties are identified, evaluated, and any adverse effects appropriately mitigated.

5.1.11 Air Quality

Air quality impacts associated with construction of ACP and SHP would include emissions from fossil-fueled construction equipment, blowdown and purging activities, open burning, and fugitive dust from earth/roadway surface disturbance. These impacts would generally be temporary and localized, and would not be expected to cause or contribute to a violation of applicable air quality standards; however, to further minimize construction emissions, Atlantic and DETI could implement measures such as enforcing idling time limits, utilizing clean diesel through add-on technologies, and using newer equipment.

Open burning would potentially occur along sections of the AP-1 mainline and TL-635 pipeline loop, which effects would be minimized by implementing Atlantic's and DETI's *Timber Removal Plan*, *Fire Plan*, and *Open Burning Plan.* Based on the mitigation measures outlined in Atlantic and DETI's *Fugitive Dust Control and Mitigation Plan* and the temporary nature of construction, we conclude that construction of ACP and SHP would not have a significant impact on air quality. Following construction at the compressor stations, emissions would transition to operating emissions.

Operation of ACP and SHP would generate emissions of nitrogen oxides, carbon monoxide, and particulate matter, sulfur dioxide, volatile organic compounds, GHGs, and hazardous air pollutants. ACP's proposed new Compressor Stations 1, 2, and 3 would be subject to a PSD major source threshold of 250 tpy. Potential operational emissions from the Crayne and J.B. Tonkin Compressor Stations after proposed modifications would remain below PSD major source thresholds; therefore, these stations would not be subject to PSD regulations. While emissions from the Mockingbird Hill Compressor Station would be minor, the net emissions increase of PM, PM_{10}, $PM_{2.5}$, and GHGs would still exceed the major modification thresholds, representing a significant net emissions increase and required BACT analysis. The Mockingbird Hill and JB Tonkin Compressor Stations are currently subject to Title V regulations and would remain Title V facilities after construction. The Crayne Compressor Station, authorized under a State operating permit, is a minor source under Title V and would remain so after construction of SHP.

The Mockingbird Hill Compressor Station is approximately 70 miles (about 113 kilometers) northeast of the Otter Creek Wilderness Class I area and 80 miles (about 129 kilometers) northeast of the Dolly Sods Wilderness Class I area, both of which are managed by the FS. Because the Mockingbird Hill Compressor Station is more than 100 kilometers from these Class I areas an assessment of the impact on these Class I areas is not required. However, the WVDEP may be responsible for notifying the federal land manager and determining any needed additional analysis, as part of the PSD permitting process.

The emissions that would occur in nonattainment or maintenance areas would not exceed the general conformity applicability thresholds for any criteria pollutant in a single calendar year. Therefore, general conformity would not apply to ACP and SHP.

5.1.12 Noise

Noise would be generated during construction of the proposed facilities. Construction activities in any one area would typically last from several days to several weeks on an intermittent basis. Construction equipment would be operated on an as-needed basis during this period. Construction of ACP and SHP would be limited primarily to daytime hours except for some discrete construction related activities (e.g., hydrostatic testing, tie-ins, purge and packing the pipeline, and select HDD work). Generally, nighttime noise is expected to increase only in localized areas near 24-hour HDD activities. These activities are expected to last for 3 to 6 weeks at each location, apart from the James River/Mayo Creek HDD (3 to 4 months) and the BRP/ANST HDD (12 to 14 months). In addition, Atlantic would notify residents 1 month prior to the start of HDD operations, and would finalize temporary relocation plans 2 weeks prior to drilling.

Atlantic and DETI conducted a noise assessment for the estimated noise levels from HDD entry and exit sites at the nearest NSA. In some instances, noise may be greater at NSAs slightly farther than the closest NSA due to topography, local vegetation patterns, proximity to both the entry and exit sites, and ACP’s mitigation measures. To ensure that no NSAs would be impacted by the two new proposed HDDs, we are recommending that Atlantic provide in its Implementation Plan aerial photographs depicting the entry and exit sites for the proposed Interstate 79 and Route 58 HDDs. The aerials should identify any NSAs within 0.5 mile of the entry/exit sites for each HDD or clearly demonstrate that there are no NSAs within 0.5 mile of the entry/exit sites.

We received comments from the Fenton Inn that noise from HDD activities could impact its business. The Fenton Inn is approximately 400 feet from the southeast BRP HDD entry point at the nearest structure. However, we note that Atlantic completed its noise analysis assuming the Fenton Inn was 600 feet from the HDD entry point (thus underestimating the noise impact at the Inn), and we have taken this discrepancy into consideration of our noise analysis. Atlantic proposes to install a noise barrier wall at the entry site near the Fenton Inn, as recommended by Atlantic’s noise consultant. As a result, the increase in noise level experienced at the NSA would be below 3 dBA, or the threshold of noticeable difference. We also received comments from the Wintergreen Property Association indicating that its Gatehouse (approximately 600 feet away) and office building (approximately 900 feet away) were omitted as an NSA near the BRP HDD site. To ensure that the actual HDD noise levels are below our noise criterion at the

Fenton Inn and the Gatehouse for the Wintergreen Property Owners Association, and that HDD noise levels do not significantly impact the NSAs near the Route 17 and Swift Creek entry and exit sites, we have recommended that Atlantic file in the weekly construction status reports for NSA S9 and the Gatehouse near BRP, the Route 17 HDD entry and exit sites, and NSAs S11, S13, and S14 near the Swift Creek entry site, the noise measurements from these NSAs obtained at the start of drilling operations, the noise mitigation that Atlantic implemented at the start of drilling operations, and any additional mitigation measures that Atlantic would implement if the initial noise measurements exceed an L_{dn} of 55 dBA at the nearest NSA and/or increased noise is greater than 10 dBA over ambient conditions.

We received numerous comments regarding excessive, harmful noise from ACP and SHP compressor stations. Each compressor station associated with the projects would meet the FERC guidelines, except for the JB Tonkin Compressor Station in Westmoreland County, Pennsylvania, where the noise level currently exceeds FERC guidelines at three NSAs. However, at these locations, DETI estimates that the station noise would be reduced from current levels. In addition, the noise increases for all stations range from 0 to 8.5 dBA, with most NSAs experiencing increases near or below 3 dBA, which is the threshold of perception for the human ear. As such, we find that noise levels attributable to ACP and SHP compressor stations at the nearest NSAs would not be significant.

NSAs S10, S11, S12, and S14 would experience total noise levels above the FERC guideline after the proposed modifications at the JB Tonkin Compressor Station; however, these NSAs would experience an overall *decrease* in noise ranging from 1.1 dBA to 3.9 dBA. However, to ensure that noise levels due to operation of the proposed compressor stations would not be significant, we are recommending that Atlantic and DETI file a noise survey no later than 60 days after placing each of ACP and DETI compressor stations in service. If a full load condition noise survey is not possible, Atlantic and DETI should instead file an interim survey at the maximum possible horsepower load and file the full load survey within 6 months. If the noise attributable to the operation of all the equipment at any station under interim or full horsepower load exceeds 55 dBA, L_{dn} at any nearby NSA, Atlantic and DETI should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Atlantic and DETI should confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.

We received comments stating that ACP and SHP compressor stations would cause vibrations; specifically, Compressor Station 2 (Buckingham County, Virginia). FERC regulations require that no perceptible increase in vibration may occur as a result of compressor station operation. The proposed compressor units at all compressor stations, including Compressor Station 2, would be combustion turbines. As such, we do not expect there to be an issue with vibration, as it is more characteristic of reciprocating engines. Through FERC's Landowner Helpline, we are aware that induced vibration, or a low frequency sound from compressor stations, has occurred at a limited number of natural gas facilities in the over 300,000 miles of transmission pipeline in the United States. However, we are unaware of wide-scale cases of low frequency noise from natural gas transmission facilities. With hundreds of thousands of residents near natural gas pipelines and compressor stations, we have seen no systematic evidence that natural gas pipelines or compressor stations are inducing noise effects on local residences. This appears to be an isolated issue that continues to be addressed through the dispute resolution service and landowner helpline.

Landowners near the proposed and modified compressor stations expressed concern with the noise levels resulting from compressor station operations and blowdown events. Planned blowdowns occur because of maintenance activities; Atlantic and DETI would incorporate blowdown silencers to minimize noise during planned blowdowns. Projected sound levels associated with planned blowdown events are estimated to be about 31 dBA at 1,000 feet away and would remain below 55 dBA L_{dn} at the nearest NSAs. Planned blowdown events at each compressor station would be infrequent, lasting from 1 to 5 minutes. Specifically, the unit blowdown silencer at each station would be designed to limit blowdown noise to a maximum A-weighted sound level of 60 dBA at 50 feet. Unplanned blowdown events would be very infrequent and would occur in the event of an emergency. The sound levels associated with an unplanned, unsilenced station blowdown would be about 100 dBA at 1,000 feet away. Given the non-routine nature and short-term duration of these blowdown events, we do not believe that they would be a significant contributor to operational noise from the projects.

On March 24, 2017, Atlantic filed noise surveys for its proposed M&R stations. The Long Run, Brunswick, Greensville, and Fayetteville M&R Stations do not have residences or other NSAs within 0.5 mile of the proposed sites. Although estimated M&R total station noise after proposed modifications would exceed the FERC level of 55 dBA Ldn in most cases, the M&R station would not contribute to this increase because the existing ambient noise levels already exceed this level.

Atlantic and DETI indicate that blasting may be necessary at certain locations during construction. Blasting would cause noise but would be conducted in accordance with Atlantic's and DETI's *Blasting Plan* that require limiting the amount of charge needed to complete the work and require notification of persons in the area.

Given adherence to Atlantic's and DETI's proposed measures as well as our additional recommendations, we conclude that potential air and noise-related impacts associated with ACP and SHP would be adequately minimized or mitigated.

5.1.13 Reliability and Safety

The pipeline and aboveground facilities associated with ACP and SHP would be designed, constructed, operated, and maintained to meet the DOT *Minimum Federal Safety Standards* in 49 CFR 192 and other applicable federal and state regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion. The DOT rules require regular inspection and maintenance, including repairs as necessary, to ensure the pipeline has adequate strength to transport the natural gas safely.

We received comments regarding the potential for fires and controlled burns to affect the proposed pipeline facilities. DOT requirements do not include standards for the use of fire-resistant materials during the installation of underground natural gas pipelines. However, Atlantic and DETI would develop emergency plans that would include establishing and maintaining adequate means of communication with appropriate fire, police, and other public officials, and developing prompt and effective response to a notice of each type of emergency, including that of a fire near or directly involving a pipeline facility.

We received comments from Wintergreen Resort, Bath County, Virginia, and members of other communities regarding single-point access roads and the ability to evacuate in event of an emergency. Prior to completion of construction, DETI Operations would provide information, including the pipeline location, to local emergency planning committees to support the development of Operational Emergency Response Plans, which would address incident evacuation requirements. During operation, Atlantic and DETI would continue to meet with the emergency services departments of the municipalities and counties along the proposed pipeline facilities on an ongoing basis as part of their liaison programs and as required by the DOT's federal safety standards. Atlantic and DETI would provide these departments with emergency contact information and verbal, written, and mapping descriptions of the pipeline systems. This liaison program would identify the appropriate fire, police, and public officials and the responsibilities of each organization that may respond to a gas pipeline emergency, and coordinate mutual assistance in responding to emergencies.

We received several comments about impacts on residences and public safety resulting from operation of the proposed compressor stations. ACP and SHP aboveground facilities would be designed, constructed, operated, and maintained in accordance with DOT *Minimum Federal Safety Standards* in 49 CFR 192.

We received comments on the draft EIS regarding impacts of heavy farm equipment and other large vehicles crossing the pipeline in open areas (i.e., not at road crossings). Atlantic and DETI have stated that normal farm equipment may cross the pipeline without prior notification from landowners. In addition, Atlantic and DETI would discuss provisions with local emergency planning committees to ensure emergency responders have access. As part of their easement negotiations with landowners and project planning, Atlantic and DETI stated they would provide stabilized crossings for existing driveways and access roads where heavy loads are anticipated. If a heavy load is proposed after construction, the landowner would need to contact DETI Field Engineering, after which an engineer would analyze the equipment specifications and pipeline specifications to determine if it is safe to cross the pipeline and, if necessary, identify measures to make it safe to cross (e.g., a timber mat or a layer of stone or dirt). For the portion of ACP on NFS lands, current and future crossings of the pipeline corridor (e.g., roads, trails, skid roads) may be constructed, reconstructed, maintained, decommissioned, etc. anywhere across the length of the proposed pipeline project on the MNF and GWNF. The FS would coordinate with Atlantic regarding any such crossings to address safety considerations.

We received comments regarding the safety of ACP and SHP pipelines during construction, including children’s safety, and about the need for safety inspections of the construction activities. Atlantic’s and DETI’s contractors, including construction workers, would be required to adhere to federal and state safety regulations and recommendations. In addition, if the project is approved, FERC staff or its contractors would routinely inspect construction activities to ensure compliance with the conditions in the Commission’s Order.

We conclude that Atlantic’s and DETI’s compliance with applicable design, construction and maintenance standards, and DOT safety regulations would be protective of public safety.

5.1.14 Cumulative Impacts

If constructed, ACP and SHP and other projects in the area could result in varying degrees of cumulative impact on different resources depending on the type and scope of each project, their proximity to each other, the timeframe in which they are constructed, and the measures that would be implemented to avoid or reduce impacts at each project site.

ACP and SHP would temporarily and permanently impact the environment. We found that most impacts would be temporary to short-term during construction and restoration of the projects. Long-term to permanent impacts were found where the operational easement would be cleared of trees, and where compressor stations would emit air pollutants during operation. Permanent impacts would occur at aboveground facilities and permanent new access roads. We conclude that with the mitigation measures proposed by Atlantic and DETI, our recommendations, and/or measures required by other agency permits, ACP and SHP would result in limited adverse environmental impacts, with the exceptions of impacts on steep slopes and adjacent waterbodies and associated aquatic resources; forested vegetation; ESA-listed Indiana bat, northern long-eared bat, Roanoke logperch, Madison cave isopod, clubshell mussel, small whorled pogonia, and running buffalo clover; and karst, cave, subterranean habitat and the species associated with these habitats.

Impacts resulting from ACP and SHP would mostly be limited to the construction right-of-way, ATWS, contractor yards, and new access roads. In terms of other projects that were recently constructed, or may be constructed in the near future, we also considered permanent impacts on specific environmental resources (i.e., removal of forest). Reasonably foreseeable future projects of comparable magnitude or nature of impacts as ACP and SHP were included in the cumulative effects analysis if they were anticipated to occur up through mid-2019 and were located within the geographic scope of influence defined for each resource (e.g., HUC-10 watershed, APE). We identified eight types of projects that would potentially cause a cumulative impact when considered with the proposed project: oil and gas exploration and production; FERC-jurisdictional natural gas interstate transportation projects; mining operations; nonjurisdictional natural gas gathering systems; transportation or road projects; commercial/residential/industrial and other development projects; power plants or electric transmission lines; and projects planned on NFS lands.

We received comments on the draft EIS requesting that further indirect or secondary effects of the project be considered such as population growth, increased industry, housing, and associated infrastructure to deliver natural gas to residential customers. The EIS was prepared in accordance with NEPA, CEQ guidelines, and other applicable requirements. The EIS is consistent with FERC style, formatting, and policy regarding NEPA evaluation of alternatives and different types of impacts, including cumulative impacts for a linear "corridor-type" project. Indirect effects to the extent known were considered in the cumulative impacts analysis. With regards to additional infrastructure, economic and population growth, etc., while these could be considered reasonably foreseeable, the timing, location, and extent of these factors is highly speculative.

FERC considered projects of comparable magnitude, projects that would occur during the same general timeframe as the proposed project (regardless of size), and projects that are affecting or would affect similar resources within the same defined geographic area of scope. We do not deny that a pipeline project such as ACP and SHP could have an indirect or secondary impact later in time. However, when and if these additional activities or projects occur, they would be the result of many factors, not just the pipeline project, and would be subject to an environmental review by the federal, state, or local agency permitting their activity when they are identified as needed.

The geographic scope for ACP and SHP has been affected by human activities for over 15,000 years, beginning with the original settlement of North America by Native Americans. The indigenous communities were affected by European settlement beginning in the 17th century. Human modifications to the landscape include the imprints of farming and timbering activities. As a result, most of the forest in the project area is tertiary or secondary. Although the region has been substantially affected by human activity, natural resources remain. There are still large portions of the project area that are currently rural and not densely occupied. NWI data indicate that there are about 829,616 acres (FWS, 2016l) of wetlands in the HUC-10 watersheds crossed by ACP and SHP, and NLCD from the EPA indicates that there are about 4,334,392 acres of upland forest in these same HUC-10 watersheds (EPA, 2016c).

The potential impacts that we considered as part of our cumulative review pertain to geology and soils; groundwater, surface water, and wetlands; vegetation; wildlife; fisheries and aquatic resources; land use, special interest areas, and visual resources; socioeconomics; cultural resources; air quality (including climate change); and noise. Most cumulative impacts would be temporary and minor when considered in combination with past, present, and reasonably foreseeable activities. Long-term but minor cumulative impacts would occur on wetland, upland forested vegetation, and associated wildlife habitats, as well as waterbodies, special status species, and visual quality. Impacts on habitat of wildlife species with limited mobility and home ranges, such as impacts on vernal pools, rocky outcrops, and subterranean features, could result in long-term impacts on certain species. Subterranean obligate species are often endemic to only a few known locations, and are vulnerable to changes in hydrological pattern or water quality (WVDNR, 2015a); therefore, it is possible that impacts associated with construction activities could have population-level effects on these species. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials. There is also the potential that ACP and SHP would contribute to a cumulative improvement in regional air quality if a portion of the natural gas associated with the proposed projects displaces the use of other more polluting fossil fuels.

5.1.15 Alternatives

As an alternative to the proposed action, we evaluated the no-action alternative, system alternatives, route alternatives and variations, and aboveground facility site alternatives. While the no-action alternative would eliminate the short- and long-term environmental impacts identified in this EIS, the end-use markets would not be provided the 1.44 Bcf/d of natural gas to the delivery points specified by the precedent agreements signed by Atlantic and DETI within a timeframe reasonably similar to the proposed projects. Because this alternative would not be able to meet the purpose of ACP and SHP, we conclude it is not preferable to the proposed action. We also conclude alternative energy sources, energy conservation, and efficiency are not within the scope of this analysis because the purpose of ACP and SHP is to transport natural gas. The generation of electricity from renewable energy sources, or the gains realized from increased energy efficiency and conservation, are not transportation alternatives.

Our analysis of system alternatives included an evaluation of whether the use of other existing or proposed natural gas transmission systems; additional compression/looping; a domestic LNG impact/export terminal; and trucks and/or rail could meet Atlantic's and DETI's objectives while offering an environmental advantage. Other existing natural gas transmission systems in ACP and SHP area lack the available capacity to meet the purpose of the project. Modifying these systems could result in impacts similar to those of the proposed project or would be economically impractical. Additional compression/looping would not offer a significant environmental advantage over the proposed actions. We also evaluated the feasibility of merging ACP and MVP into one pipeline system. Although the merged system holds several environmental advantages over constructing both projects separately, including increased collocation, avoidance of MNF and GWNF, reduced crossings of the ANST and BRP, reduced number of access roads and contractor/pipe yards, and less construction across karst terrain; construction of the merged systems would require an additional 30 feet or more of extra construction right-of-way width, would increase air and noise emissions due to the additional compression required, and would result in a significant delay of delivery of natural gas to the proposed customers of both MVP and ACP.

The use of an alternative transportation system, LNG sourced gas, and/or truck or rail was also evaluated and was found to be inefficient, insufficient to meet requested delivery volumes, and economically impractical. We conclude that the use of a system alternative is not preferable to the proposed action.

We evaluated 27 major pipeline route alternatives, including routes that would follow the proposed MVP right-of-way, existing electric transmission rights-of-way, and interstate/highway rights-of-way, and several variations to avoid or minimize crossing of NFS and NPS lands. We also evaluated four route variations and reviewed over 201 variations considered by Atlantic and DETI. Furthermore, we evaluated several alternatives for Atlantic's proposed Compressor Stations 1, 2, and 3. We also evaluated the feasibility of using electric motor-driven compressors as an alternative to the natural gas-driven compressors proposed for ACP. Increasing collocation with existing rights-of-way, avoiding federal lands, concern about construction through karst sensitive terrain, impacts on affected landowners and communities, and general environmental concerns were all reasons for evaluating pipeline alternatives and variations. In evaluating these alternatives and variations, we compared several factors including (but not limited to) total length, acres affected, wetlands and waterbodies crossed, forested land crossed, the number of residences within 50 feet of workspace, public land crossed, recreation features crossed, and collocation with existing rights-of-way. We also considered construction constraints and economic practicality.

Based on our evaluations, we conclude that the major pipeline route alternatives do not offer a significant environmental advantage when compared to the proposed route or would not be economically practical; and therefore, are not preferable to the proposed action. We are recommending that Atlantic continue to consult with the Westmoreland Conservancy regarding a route variation to minimize impacts on conservation easements and incorporate the Butterwood Creek Route Variation into the final ACP route. Lastly, we conclude that the alternative aboveground facility locations evaluated do not offer significant environmental advantages when compared to the proposed locations and are not preferable to the proposed action. In summary, we have determined that Atlantic and DETI's proposed projects, as modified by our recommended mitigation measures and route variation, is the preferred alternative than can meet the projects' objectives.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes ACP and SHP, we recommend that the following measures be included as specific conditions in the Commission's Order. We believe that these measures would further mitigate the environmental impact associated with construction and operation of the proposed ACP and SHP.

1. Atlantic and DETI shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. Atlantic and DETI must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

    b. justify each modification relative to site-specific conditions;

    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

    d. receive approval in writing from the Director of OEP **before using that modification**.

2. The Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of ACP and SHP. This authority shall allow:

    a. the modification of conditions of the Order; and

    b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction (and operation).

3. **Prior to any construction**, Atlantic and DETI shall file affirmative statements with the Secretary, certified by senior company officials, that all company personnel, EIs, and contractor personnel would be informed of the EIs' authority and have been or would be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.

4. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets, and shall include the staff's recommended Butterwood Creek Route Variation and

workspace modifications identified in the EIS. **As soon as they are available, and before the start of construction**, Atlantic and DETI shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

Atlantic's and DETI's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. Atlantic's and DETI's rights of eminent domain granted under NGA section 7(h) do not authorize them to increase the size of their natural gas facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

5. Atlantic and DETI shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations; staging areas; pipe storage yards; new access roads; and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the FERC *Plan* and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern species mitigation measures;

   c. recommendations by state regulatory authorities; and

   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **At least 45 days prior to construction**, Atlantic and DETI shall file their respective Implementation Plans with the Secretary, for review and written approval by the Director of OEP. Atlantic and DETI must file revisions to their plans as schedules change. The plans shall identify:

   a. how Atlantic and DETI would implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;

   b. how Atlantic and DETI would incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;

c. the number of EIs assigned per spread and how the company would ensure that sufficient personnel are available to implement the environmental mitigation;

d. the number of company personnel, including EIs and contractors, who would receive copies of the appropriate material;

e. the location and dates of the environmental compliance training and instructions Atlantic and DETI would give to all personnel involved with construction and restoration (initial and refresher training as the projects progress and personnel change), with the opportunity for OEP staff to participate in the training session(s);

f. the company personnel (if known) and specific portion of Atlantic's and DETI's organizations having responsibility for compliance;

g. the procedures (including use of contract penalties) Atlantic and DETI would follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram) and dates for:

    i. the completion of all required surveys and reports;

    ii. the environmental compliance training of on-site personnel;

    iii. the start of construction; and

    iv. the start and completion of restoration.

7. Atlantic and DETI shall employ a team of EIs (i.e., two or more or as may be established by the Director of OEP) per construction spread. The EI(s) shall be:

    a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

    b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;

    c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

    d. a full-time position, separate from all other activity inspectors;

    e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

    f. responsible for maintaining status reports.

8. **Beginning with the filing of the Implementation Plans**, Atlantic and DETI shall each file updated status reports with the Secretary on a weekly basis until all construction and restoration activities are complete. On request, these status reports would also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

   a. an update on Atlantic's and DETI's efforts to obtain the necessary federal authorizations;

   b. the construction status of each spread, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

   c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

   d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

   e. the effectiveness of all corrective actions implemented;

   f. a description of any landowner/resident complaints that may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

   g. copies of any correspondence received by Atlantic and DETI from other federal, state, or local permitting agencies concerning instances of noncompliance, and Atlantic's and DETI's responses.

9. Atlantic and DETI shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of ACP and SHP and restoration of the right-of-way. **Prior to construction**, Atlantic and DETI shall each mail the complaint procedures to each landowner whose property would be crossed by ACP and SHP.

   a. In its letter to affected landowners, Atlantic and DETI shall:

      i. provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon a landowner should expect a response;

      ii. instruct the landowners that if they are not satisfied with the response, they should call Atlantic's and DETI's Hotline; the letter should indicate how soon to expect a response; and

      iii. instruct the landowners that if they are still not satisfied with the response from Atlantic's and DETI's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

   b. In addition, Atlantic and DETI shall include in their respective weekly status report a copy of a table that contains the following information for each problem/concern:

      i. the identity of the caller and date of the call;

ii. the location by milepost and identification number from the authorized alignment sheet(s) of the affected property;

iii. a description of the problem/concern; and

iv. an explanation of how and when the problem was resolved, would be resolved, or why it has not been resolved.

10. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, Atlantic and DETI shall file with the Secretary documentation that they have received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Atlantic and DETI must receive written authorization from the Director of OEP **before placing their respective projects into service**. Such authorization would only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by ACP and SHP are proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in service**, Atlantic and DETI shall file affirmative statements with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities would be consistent with all applicable conditions; or

    b. identifying which of the Certificate conditions the applicant has complied with or would comply with. This statement shall also identify any areas affected by their respective projects where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

13. Atlantic shall not exercise eminent domain authority granted under section 7(h) of the NGA to acquire a permanent pipeline right-of-way exceeding 50 feet in width. In addition, where Atlantic has obtained a larger permanent right-of-way width through landowner negotiations, routine vegetation mowing and clearing over the permanent right-of-way shall not exceed 50 feet in width. (Section 2.2.1.1)

14. Atlantic and DETI shall design all workspaces that are not identified in table 2.3.1-2 of the EIS to comply with the FERC *Procedures*. Any additional modifications to the FERC *Procedures* must be requested and justified in **Atlantic's and DETI's Implementation Plans**. (Section 2.3.1.1)

15. **As part of Atlantic's and DETI's Implementation Plans and prior to receiving written authorization from the Director of the OEP to commence construction of any project facilities**, Atlantic and DETI shall file with the Secretary environmental constraints maps illustrating the avoidance and conservation measures required by the resource agencies and committed to by Atlantic and DETI along the ACP and SHP routes. The environmental constraints maps can be provided in the form of alignment sheets with a separate environmental constraints band. (Section 2.4)

16. **Prior to construction**, DETI shall continue to consult with the Westmoreland Conservancy regarding a route variation to minimize impacts on conservation easements, and shall file with the Secretary documentation regarding the results of its consultations and any proposed route modifications. (Section 3.4.2)

17. Atlantic shall incorporate the Butterwood Creek Route Variation into its final route for the ACP. **Prior to construction**, Atlantic shall file with the Secretary the results of all environmental surveys, an updated 7.5-minute USGS topographic quadrangle map, and a large-scale alignment sheet that illustrates this route change. (Section 3.4.4)

18. **As part of its Implementation Plan,** Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, the results of the fracture trace/lineament analysis utilizing remote sensing platforms (aerial photography and LiDAR), along with the results of existing dye trace studies. Atlantic shall provide the results of this analysis on a composite map(s), illustrating surficial karst features with the potential for intersecting shallow interconnected karst voids and cave systems over a wide area; specifically, between the pipeline and nearby water receptors (i.e., public water supply wells, municipal water supplies, private wells, springs, caves systems, and surface waters receiving discharge). (Section 4.1.2.3)

19. **Prior to construction, but following tree clearing**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, the results of the ERI studies along with any proposed construction modifications or alignment shifts to avoid impacts on Mingo Run and the Simmons-Mingo cave system. (Section 4.1.2.3)

20. **As part of its Implementation Plan,** Atlantic shall consult with the VDCR to determine if the route alignment and construction activities will impact the Burnsville Cove Cave Conservation Site. Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, the results of its consultations, along with any proposed construction modifications or alignment shifts to avoid impacts on this site. (Section 4.1.2.3)

21. **As part of its Implementation Plan,** Atlantic shall conduct a data review and field survey of potential karst features in Augusta County, Virginia between AP-1 MPs 106.8 and 110, and file this information with the Secretary, along with any mitigation measures, for review and written approval by the Director of OEP. (Section 4.1.2.3)

22. **Prior to completing any geotechnical boring in karst terrain**, Atlantic shall file with the Secretary verification that it consulted with VDCR karst protection personnel regarding each geotechnical boring and shall follow the Virginia Cave Board's "Karst Assessment Standard Practice" for land development when completing the borings. (Section 4.1.2.3)

23. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a revised *Karst Terrain Assessment Construction, Monitoring, and Mitigation Plan* that includes monitoring of all potential karst areas for subsidence and collapse using LiDAR monitoring methods during years 1, 2, and 5 following construction. (Section 4.1.2.3)

24. **Prior to construction**, Atlantic and DETI shall file with the Secretary:

    a. all outstanding geotechnical studies for sites SL024, SS018, SL235, and SL239; geohazard analysis field reconnaissance of the 25 sites on the AP-1 mainline and 5 sites on the TL-635 loopline (as well as any additional geotechnical studies proposed following completion of site reconnaissance of these sites); and any mitigations proposed following the geotechnical studies and geohazard analysis field reconnaissance; and

    b. status of the BIC Team analysis related to ACP and SHP. (Section 4.1.4.2)

25. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, a *Plan for Discovery of Unanticipated Paleontological Resources* that describes how Atlantic and DETI will recognize and manage significant fossils encountered during construction. This plan shall also describe the notification procedures to the appropriate authorities in each state crossed by ACP and SHP. (Section 4.1.5)

26. **Prior to construction**, Atlantic and DETI shall complete the remaining field surveys for wells and springs within 150 feet of the construction workspace, and within 500 feet of the construction workspace in karst terrain, and file the results, including type and location, with the Secretary. (Section 4.3.1.5)

27. Atlantic and DETI shall offer to conduct, with the landowner's permission, **post-construction** water quality tests, using the same parameters used in the preconstruction tests, for all water supply wells and springs within 150 feet of the construction workspace and within 500 feet of the construction workspace in karst terrain. (Section 4.3.1.7)

28. **As part of its Implementation Plan,** Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, updated site-specific crossing plans for major waterbody crossings. The plans shall include, as necessary, the location of temporary bridges and bridge type, appropriate cofferdam locations, water discharge structure locations, pump locations, and agency-imposed TOYR and construction and restoration requirements. (Section 4.3.2.2)

29. **As part of its Implementation Plan,** Atlantic shall file with the Secretary, for review and written approval by the Director of the OEP, site-specific plans to minimize and mitigate impacts on the waterbodies that will be impacted at the BRP/ANST HDD entry and exit workspaces. Final plans shall be developed in consultation the USACE and/or appropriate state agency(s). (Section 4.3.2.6)

30. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a site-specific plan for the water impoundment structure at Jennings Branch (AP-1 MP 129.1), or identify an alternative location for the structure. (Section 4.3.2.7)

31. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, proposed or potential sources of water used for dust control, anticipated quantities of water to be appropriated from each source, and the measures it will implement to ensure water sources and any related aquatic biota are not adversely affected by the appropriation activity. (Section 4.3.2.7)

32. **Prior to construction**, Atlantic and DETI shall file with the Secretary a copy of its final wetland mitigation plans and documentation of USACE approval of the plans. (Section 4.3.3.8)

33. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a revised *Restoration and Rehabilitation Plan* that incorporates recommended mitigation measures and seed mixes for Seneca State Forest based on consultation with the WVDOF. (Section 4.4.2.1)

34. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary and appropriate federal and state agencies an updated *Restoration and Rehabilitation Plan* and *Invasive Species Management Plan*, for review and written approval by the Director of OEP, that includes the following measures:

a. aerial spraying will not be utilized for invasive species control along the right-of-way;

b. no herbicides will be applied within 25 feet of ESA-listed plant species;

c. no use of herbicides or pesticides within 100 feet of a waterbody or wetland, except where allowed by state or federal agencies;

d. no spraying of insecticides or herbicides will be allowed within the 300-foot karst feature buffer, except where allowed by state or federal agencies; and

e. includes the results of the West Virginia and Virginia Natural Heritage Program recommendations for herbicide treatment adjacent to sensitive features. (Section 4.4.4)

35. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, and the FS for review and concurrence, detailed mapping of the existing conditions and proposed improvements to access road 36-016.AR1, including digital data, a description of the construction and operation impacts, including impacts on the adjacent vegetation communities, potential pond crossings identified in appendix K of the EIS, GWNF locally rare species located downslope, and identify the conservation measures that will be implemented to mitigate potential impacts. (Section 4.4.7)

36. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, a revised *Migratory Bird Plan* that incorporates the results of consultation with the WVDNR, VDGIF, and NCWRC, and verify that no additional conservation measures will be required to minimize impacts on active rookeries. In addition, table A-1 of the revised plan shall incorporate the NCWRC's recommended updates to the North Carolina BCC list. The revised plan shall also include the Virginia Piedmont Forest Block Complex, Allegheny Mountains Forest Block Complex, and the Southern Allegheny Plateau Forest Block Complex IBAs that would be crossed by ACP and SHP in Virginia and West Virginia. (Section 4.5.3.5)

37. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, revised Master Waterbody Crossing tables for ACP and SHP that address the recommended conditions in the identified column of appendix K of the EIS, and that include all NRI segments crossed. The revised table or accompanying filing shall document correspondence and input from the appropriate federal and state agencies regarding the updated information and any additional mitigation measures Atlantic and DETI will incorporate for each waterbody. (Section 4.6.1)

38. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, revised *Virginia Fish Relocation Plan, Freshwater Mussel Relocation Protocol for ACP in North Carolina*, and *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Activities*. These revised plans and protocols shall include notification to the appropriate federal and/or state agencies should an invasive aquatic species be observed or collected during relocation efforts; and, in consultation with the appropriate federal and/or state agency, identify the mitigation measures that Atlantic and DETI will implement at the crossing location if invasive aquatic species are observed. (Section 4.6.4)

39. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, an aquatic invasive species protocol for West Virginia mussel relocation efforts on both ACP and SHP (Section 4.6.4)

40. Atlantic and DETI **shall not begin construction of the proposed facilities until**:

a. all outstanding biological surveys are completed;

b. the FERC staff complete any necessary section 7 consultation with the FWS; and

c. Atlantic and DETI have received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin. (Section 4.7.1)

41. **During construction**, to minimize potential impacts of water withdrawals on ESA-listed, proposed, and under review species, Atlantic and DETI shall limit water withdrawal to not exceed 10 percent of instantaneous flow at ESA sensitive waterbodies identified in appendix K of the EIS. (Section 4.7.1)

42. **Prior to construction, but following tree clearing**, Atlantic shall:

a. conduct ERI and/or air track drilling surveys of karst features identified within the construction workspace that are located within 5 miles of known or survey-identified bat hibernacula based on the results of the 2017 karst and hibernacula surveys;

b. file a report(s) documenting these surveys with the Secretary and the appropriate federal and state agencies; and

c. if data suggests that construction activities have the potential to impact subsurface karst features that are connected to downstream bat hibernacula and/or the Madison Cave isopod suitable habitat (based on the ERI and/or air track drilling surveys), Atlantic shall consult with the FERC staff, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on these species and their habitat. (Section 4.7.1)

43. **Prior to construction and upon completion of 2017 surveys**, Atlantic and DETI shall file with the Secretary and FWS the total acreages of:

a. northern long-eared bat occupied habitat that will be impacted by ACP and SHP; and

b. northern long-eared suitable habitat that will be impacted by ACP and SHP. (Section 4.7.1.4)

44. **Following construction**, Atlantic shall replant long-leaf pine within the ATWS and the temporary construction workspace along the ACP route, and outside the 50-foot-wide permanent right-of-way, where it was cleared for construction. Based on Atlantic's May 1, 2017 supplemental filing, long-leaf pine-wire grass communities occur between AP-2 MPs 156.5 and 156.9. (Section 4.7.1.5)

45. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a hydrofracture potential analysis for the Neuse River (AP-2 MP 98.5). If the potential for hydrofracture is low, Atlantic shall utilize the HDD method at this crossing to reduce potential impacts on ESA-listed, proposed, and/or under review species. If the HDD method is not feasible, Atlantic shall consult with the FWS and NCWRC to identify additional conservation measures that Atlantic will implement at this crossing to mitigate for the potential impacts on ESA-listed, proposed, and or under review species. (Section 4.7.1.8)

46. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a hydrofracture potential analysis for the Nottoway River (AP-1 MP 260.7). If the hydrofracture potential is low, Atlantic shall utilize the HDD method at this crossing to reduce potential impacts on ESA-listed, proposed, and/or under review species. If the HDD method is not feasible, Atlantic shall consult with the FWS and VDGIF to identify additional conservation measures that Atlantic will implement at this crossing to mitigate for the potential impacts on ESA-listed, proposed, and/or under review species. (Section 4.7.1.10)

47. **As part of its Implementation Plan,** Atlantic shall file revised Carolina madtom habitat assessments based on 2017 surveys and consultations with the FWS North Carolina Field Office. This information shall also be incorporated into the ACP Master Waterbody Crossing table. **During construction**, Atlantic shall assume presence of the Carolina madtom where there is suitable habitat and implement the *North Carolina Revised Fish and Other Aquatic Taxa Collection and Relocation Protocol for Instream Construction Activities*, as well as the FWS' enhanced conservation measures for ESA sensitive waterbodies as defined in section 4.7.1 of the EIS. (Section 4.7.1.11)

48. **If the candy darter is proposed or listed during the life of ACP**, Atlantic shall assume presence of the candy darter within Knapp Creek, Clover Creek, Glade Run, Thomas Creek, and the Greenbrier River, and apply the FWS' enhanced conservation measures for aquatic species outlined in section 4.7.1 of the EIS to these waterbodies, and any perennial tributaries within 1 mile of these crossing locations to minimize impacts on this species (see appendix K of the EIS). (Section 4.7.1.12)

49. **Prior to construction, but following tree clearing**, Atlantic shall:

    a. conduct ERI and/or air track drilling surveys of the karst features identified during 2017 karst surveys that are within the construction workspace within the Madison Cave isopod priority area, including along proposed access roads;

    b. file a report(s) documenting these surveys with the Secretary, and the appropriate federal and state agencies; and

    c. if data suggests that construction activities have the potential to impact subsurface karst features that are connected to downstream Madison Cave isopod suitable habitat (based on the ERI and/or air track drilling surveys), Atlantic shall consult with the FERC staff, FWS, and VDCR, and other appropriate federal and/or state agencies to develop the appropriate site-specific mitigation measures to avoid potential impacts on this species and its habitat. (Section 4.7.1.13)

50. **As part of its Implementation Plan**, Atlantic shall file with the Secretary the results of consultation with the VDGIF regarding in-stream construction activities proposed during the Roanoke logperch VDGIF TOYR at Waqua Creek and Sturgeon Creek. Documentation shall include any additional conservation measures required by VDGIF, which shall also be incorporated into the final ACP Master Waterbody Crossing table for each waterbody. (Section 4.7.4.2)

51. **As part of its Implementation Plan**, Atlantic shall file with the Secretary the results of consultation with the VDGIF regarding in-stream construction activities proposed during the VDGIF TOYR for green floater in waterbodies where presence has been assumed for this species (see appendix K of the EIS), in addition to in-stream construction activities proposed at Sturgeon Creek during the VDGIF TOYR for Atlantic pigtoe and dwarf wedgemussel. Documentation shall

include any additional conservation measures required by the VDGIF, which shall also be incorporated into the final ACP Master Waterbody Crossing table for each waterbody. (Section 4.7.4.2)

52. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a site-specific *Organic Farm Protection Plan* for the certified organic farms affected by ACP, including (but not limited to) the milk and corn farm crossed between AP-1 MPs 141.8 and 142.4; the certified organic hog farm crossed between AP-2 MPs 118.8 and 118.9; and any additional certified organic farms not previously identified prior to construction. (Section 4.8.1.1)

53. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, a final *Timber Removal Plan* that:

    a. incorporates the recommendations included in the VDEQ's letter dated April 6, 2017 (Accession No. 20170406-5489);

    b. updates the construction schedule discussion; and

    c. updates all TOYR related to migratory birds and special status species for tree clearing. (Section 4.8.1.1)

54. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, finalized site-specific *Timber Extraction Plans*. (Section 4.8.1.1)

55. **As part of its Implementation Plan**, Atlantic shall file a final copy of its *Haul Plan*, which will address transportation of equipment, materials, and personnel along narrow public roads in steep terrain. (Section 4.8.1.4)

56. **As part of their Implementation Plans**, Atlantic and DETI shall file with the Secretary, for review and written approval by the Director of OEP, final site-specific *RCPs* for all residences within 50 feet of the construction work areas identified after issuance of the draft EIS (including the residence at AP-1 MP 169.4). (Section 4.8.3)

57. **As part of its Implementation Plan**, Atlantic shall identify by milepost the locations where it will adopt a narrowed right-of-way to reduce impacts on forest land within the Seneca State Forest, and identify the locations of corresponding ATWS. Atlantic shall also provide updated and reduced construction impacts information for all applicable resources (land use, wetlands, soils, vegetation, cultural resources, etc.) affected by the changes to construction right-of-way and ATWS. (Section 4.8.5.1)

58. **Prior to construction**, Atlantic shall file with the Secretary documentation of concurrence from the VDEQ that ACP is consistent with the CZMA. (Section 4.8.6)

59. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a finalized *Contaminated Media Plan* that considers the recommendations included in the VDEQ's letter dated April 6, 2017 (Accession No. 20170406-5489). As appropriate, provide evidence of consultations with the VDEQ regarding its comments on the *Contaminated Media Plan.* (Section 4.8.7)

60. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, site-specific visual mitigation measures for each scenic byway developed in consultation with the DOT, FHA, WVDOT, VDOT, VDCR, and NCDOT. Atlantic shall also provide documentation of agency consultation. (Section 4.8.8.2)

61. **As part of its Implementation Plan**, Atlantic shall identify mitigation measures, for review and written approval by the Director of OEP, to reduce the impacts on the Fenton Inn at approximately AP-1 MP 158.7 resulting from lighting equipment needed to support the HDD of the BRP and ANST. (Section 4.8.8.2)

62. **As part of its Implementation Plan**, Atlantic shall file with the Secretary the locations where it will adopt a narrowed right-of-way to reduce impacts on forest land and ecologically sensitive areas within the MNF and GWNF, along with the locations of corresponding ATWS. (Section 4.8.9.1)

63. **As part of its Implementation Plan**, Atlantic shall file with the Secretary a revised trail, road, and railroad crossing table that lists the final crossing method that it will implement at each trail, road, and railroad. The crossing method at trails and roads on the GWNF shall be developed in consultation with GWNF staff. (Section 4.8.9.1)

64. **As part of its Implementation Plan**, Atlantic shall, if a bore or HDD crossing is not feasible, file with the Secretary, for review and written approval by the Director of OEP, site-specific crossing plans that identify the location(s) of a detour, public notification, signage, and consideration of avoiding days of peak usage for each trail and road affected by ACP on the GWNF. The crossing plans shall be developed in consultation with GWNF staff. (Section 4.8.9.1)

65. **As part of its Implementation Plan**, Atlantic shall file with the Secretary, for review and written approval by the Director of OEP, a final site-specific HDD crossing plan and an alternative direct pipe crossing plan for the BRP. Provide documentation that Atlantic has consulted with the NPS regarding both of these plans and adopted or addressed any substantive comments from the NPS into these plans. (Section 4.8.9.1)

66. Atlantic and DETI shall **not begin** construction of ACP and SHP facilities or use of contractor yards, ATWS, or new or to-be-improved access roads **until**:

    a. Atlantic files with the Secretary documentation of communications with the Lumbee Indian Nation, Coharie Tribal Council, Haliwa-Saponi Tribe, and the Meherrin Tribe regarding traditional tribal sites, including natural resources gathering locations in the project area;

    b. Atlantic and DETI file with the Secretary:

        i. all survey reports, evaluation reports, reports assessing project effects, and site treatment plans, and cemetery avoidance treatment plans;

        ii. comments on all reports and plans from the Pennsylvania, West Virginia, Virginia, and North Carolina SHPOs, the MNF, GWNF, and NPS, as well as any comments from federally recognized Indian tribes, and other consulting parties, as applicable; and

        iii. revised *Unanticipated Discovery Plans* that include tribal contact information for those tribes that request notification following post-review discovery of archaeological sites, including human remains, during project activities;

c. the ACHP is afforded an opportunity to comment if historic properties will be adversely affected; and

d. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Atlantic and DETI in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

All material filed with the Commission that contains **location, character, and ownership** information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering "**CUI//PRIV – DO NOT RELEASE**." (Section 4.10.7)

67. **As part of its Implementation Plan**, Atlantic shall file with the Secretary aerial photographs depicting the entry and exit sites for the proposed Interstate 79 and Route 58 HDDs. The aerials shall identify any NSAs within 0.5 mile of the entry/exit sites for each HDD or clearly demonstrate that there are no NSAs within 0.5 mile of the entry/exit sites. (Section 4.11.2.2)

68. Atlantic shall file in the **weekly construction status reports** the following for NSA S9, the Gatehouse, and the office building near BRP; the Route 17 HDD entry and exit sites; and NSAs S11, S13, and S14 near the Swift Creek entry site:

a. the noise measurements from these NSAs, obtained at the start of drilling operations;

b. the noise mitigation that Atlantic implemented at the start of drilling operations; and

c. any additional mitigation measures that Atlantic will implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise is greater than 10 dBA over ambient conditions. (Section 4.11.2.2)

69. Atlantic shall file a noise survey with the Secretary **no later than 60 days** after placing each of the ACP compressor stations in service. If a full load condition noise survey is not possible, Atlantic shall instead file an interim survey at the maximum possible horsepower load and file the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at any station under interim or full horsepower load exceeds 55 dBA, L_{dn} at any nearby NSA, Atlantic shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Atlantic shall confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section 4.11.2.2)

70. DETI shall file a noise survey with the Secretary **no later than 60 days** after placing the JB Tonkin Compressor Station in service. If a full load condition noise survey of the entire station is not possible, DETI shall instead file an interim survey at the maximum possible horsepower load and file the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the JB Tonkin Compressor Station under interim or full horsepower load conditions exceeds existing levels at NSAs S10, S11, S12, and S14 or 55 dBA L_{dn} at any other nearby NSAs, DETI shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. DETI shall confirm compliance with the above requirements by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section 4.11.2.2)

71. DETI shall file a noise survey with the Secretary **no later than 60 days** after placing each of the Crayne and Mockingbird Hill Compressor Stations in service. If a full load condition noise survey of the entire station is not possible, DETI shall instead file an interim survey at the maximum possible horsepower load and file the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Crayne and Mockingbird Hill Compressor Stations under interim or full horsepower load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, DETI shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. DETI shall confirm compliance with the 55 dBA L_{dn} requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (Section 4.11.2.2)

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