Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, NE, Washington, DC 20426

FERC/EIS-0297D **July 2019**

Southgate Project

Draft Environmental Impact Statement

Mountain Valley Pipeline, LLC
FERC Docket No.: CP19-14-000

Cooperating Agencies:

U.S. Army Corps of Engineers

U.S. Fish & Wildlife Service

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 3
Mountain Valley Pipeline, LLC.
Southgate Project
Docket No. CP19-14-000

TO THE INTERESTED PARTIES:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a draft environmental impact statement (EIS) for the Southgate Project (Project) proposed by Mountain Valley Pipeline, LLC (Mountain Valley). Mountain Valley requests authorization to construct and operate approximately 73 miles of natural gas transmission pipeline, one new compressor station, and accompanying facilities that would provide 375 million cubic feet of gas per day of available capacity for transport from the City of Chatham, in Pittsylvania County, Virginia to a delivery point with Dominion Energy (formerly PSNC) near the City of Graham in Alamance County, North Carolina.

The draft EIS assesses the potential environmental effects of the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the Project would result in some adverse environmental impacts. However, if the Project is constructed and operated in accordance with applicable laws and regulations, the mitigation measures discussed in this EIS, and our recommendations, these impacts would be reduced to less-than-significant levels.

The United States Army Corps of Engineers (COE) and the U.S. Department of the Interior Fish and Wildlife Service (FWS) participated as cooperating agencies in preparation of this draft EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the NEPA analysis.

The COE would use this EIS in their regulatory process, and to satisfy compliance with NEPA and other related federal environmental laws (e.g., the National Historic Preservation Act). Although the cooperating agencies provided input to the conclusions and recommendations presented in the draft EIS, the agencies would present their own conclusions and recommendations in a combined Record of Decision (ROD) for the Project, if required.

The draft EIS addresses the potential environmental effects of the construction and operation of the following Project facilities:

- about 73 miles of new 24-inch and 16-inch diameter natural gas pipeline located in Pittsylvania County, Virginia, and Rockingham and Alamance Counties, North Carolina.;
- one new 28,915 horsepower compressor station (Lambert Compressor Station) in Pittsylvania County, Virginia;
- four interconnects or tie-ins with facilities operated by Mountain Valley, East Tennessee Gas, and Dominion Energy; and
- ancillary facilities including pig launchers and receivers, mainline block valves (MLV), and cathodic protection beds.

The Commission mailed a copy of the *Notice of Availability* of the draft EIS to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Indian Tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the area of the Project. The draft EIS is available in hard copy at libraries in the area of the Project and in electronic format. It may be viewed and downloaded from the FERC's website (www.ferc.gov), on the Environmental Documents page (https://www.ferc.gov/industries/gas/enviro/eis.asp). In addition, the draft EIS may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://www.ferc.gov/docs-filing/elibrary.asp), click on General Search, and enter the docket number in the "Docket Number" field, excluding the last three digits (i.e., CP19-14). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676, or for TTY, contact (202) 502-8659.

Any person wishing to comment on the draft EIS may do so. Your comments should focus on the draft EIS's disclosure and discussion of potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they will be. To ensure consideration of your comments on the proposal in the final EIS, it is important that the Commission receive your comments on or before 5:00 p.m. Eastern Time on **September 16, 2019**.

For your convenience, there are four methods you can use to submit your comments to the Commission. The Commission will provide equal consideration to all comments received, whether filed in written form or provided verbally. The Commission encourages electronic filing of comments and has staff available to assist you at (866) 208-3676 or FercOnlineSupport@ferc.gov. Please carefully follow these instructions so that your comments are properly recorded.

1) You can file your comments electronically using the eComment feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. This is an easy method for submitting brief, text-only comments on the Project;

2) You can file your comments electronically by using the eFiling feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. With eFiling, you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." If you are filing a comment on a particular project, please select "Comment on a Filing" as the filing type; or

3) You can file a paper copy of your comments by mailing them to the following address. Be sure to reference the Project docket number (CP19-14-000) with your submission: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426.

4) In lieu of sending written or electronic comments, the Commission invites you to attend one of the public comment sessions that will be held in the Project area to receive comments on the draft EIS, scheduled as follows:

Date and Time	**Location**
August 19, 2019 5:00 – 8:00 p.m	Rockingham Community College 215 Wrenn Memorial Road Wentworth, NC 27375 (336) 342-4261
August 20, 2019 5:00 – 8:00 p.m	Olde Dominion Ag Complex 19783 U.S. Hwy. 29 South Chatham, VA 24531 (434) 432-8026
August 22, 2019 5:00 – 8:00 p.m.	Vailtree Event Center 1567 Bakatsias Lane Haw River, NC 27258 (336) 578-4020

The primary goal of these comment sessions is to provide the public with another method for identifying specific environmental issues and concerns with the draft EIS. Individual verbal comments will be taken on a one-on-one basis with a court reporter. This format is designed to receive the maximum amount of verbal comments in a convenient way during the timeframe allotted.

Each comment session is scheduled from 5:00 p.m. to 8:00 p.m. EST. You may arrive at any time after 5:00 p.m. There will not be a formal presentation by Commission staff when the session opens. If you wish to speak, the Commission staff will hand out numbers in the order of your arrival; distribution of numbers will be discontinued at 7:00

p.m. in order to ensure all comments are received by the session closing time. However, if no additional numbers have been handed out and all individuals who wish to provide comments have had an opportunity to do so, staff may conclude the session at 7:00 p.m.

Your verbal comments will be recorded by the court reporter (with FERC staff or representative present) and become part of the public record for this proceeding. Transcripts will be publicly available on FERC's eLibrary system (see below for instructions on using eLibrary). If a significant number of people are interested in providing verbal comments in the one-on-one settings, a time limit of 3 to 5 minutes may be implemented for each commentor.

It is important to note that verbal comments hold the same weight as written or electronically submitted comments. Although there will not be a formal presentation, Commission staff will be available throughout the comment session to answer your questions about the FERC environmental review process.

Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (18 CFR 385.214). Motions to intervene are more fully described at http://www.ferc.gov/resources/guides/how-to/intervene.asp. Only intervenors have the right to seek rehearing or judicial review of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding which no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Questions?

Additional information about the Project is available from the Commission's Office of External Affairs, at **(866) 208-FERC**, or on the FERC website (www.ferc.gov) using the eLibrary link. The eLibrary link also provides access to the texts of all formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp.

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TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
°F	degrees Fahrenheit
μg/l	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
ACHP	Advisory Council on Historic Preservation
ACP	Atlantic Coast Pipeline
AOI	area of interest
APE	area of potential effect
AQCR	Air Quality Control Region
ASCE	American Society of Civil Engineers
ATV	all-terrain vehicles
ATWS	additional temporary workspaces
BA	biological assessment
BACT	Best Available Control Technology
BCC	Birds of Conservation Concern
bcf/d	billion cubic feet per day
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLS	Bureau of Labor Statistics
BMP	best management practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CH_4	Methane
CI	Chief Inspector
CLG	Certified Local Governments
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalents
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
CWA	Clean Water Act
dB	unweighted decibel
dBA	decibels on the A weighted decibel scale
DOI	Department of the Interior
DOT	U.S. Department of Transportation
Dth/d	dekatherms per day
E&SC Plan	Erosion and Sediment Control Plan
East Tennessee	East Tennessee Natural Gas, LLC
ECD	Erosion control device
eGRID	EPA's Emissions & Generation Resource Integrated Database
EI	Environmental Inspector
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act of 2005
ESA	Endangered Species Act
ESD	emergency shutdown
FEMA	Federal Emergency Management Agency
FERC Plan	*Upland Erosion Control, Revegetation and Maintenance Plan*
FERC Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FR	Federal Register
FWS	U.S. Fish and Wildlife
GCCC	Governor's Commission on Climate Change
GHG	greenhouse gas
GIS	Geographic Information System
gpm	gallons per minute
HAP	hazardous air pollutant
HCA	High Consequence Area
HDD	horizontal directional drill
hp	Horsepower

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
HPSA	Health Professional Shortage Areas
HQW	High Quality Waters
HUC	Hydrologic Unit Code
Hz	Hertz
IBA	Important Bird Area
IBC	International Building Code
IMP	Integrity Management Plan
IPaC	Information for Planning and Conservation
IR	Inadvertent Return
ISO	International Organization for Standardization
JLRB	Jordan Lake Riparian Buffer
Km	kilometer
L_{dn}	day-night sound level
L_{eq}	10-minute average noise level
$L_{eq(24)}$	24-hour equivalent sound level
LiDAR	Light Imaging Detection and Ranging
L_{max}	maximum noise level
LNG	liquefied natural gas
M&R	Meter and Regulator
MACT	Maximum Achievable Control Technology
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
MLV	mainline block valve
MMBtu/hr	million British thermal units per hour
MMcf/d	million cubic feet per day
MMI	Modified Mercalli Intensity
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
Mountain Valley	Mountain Valley Pipeline, LLC
MP	milepost
MUA/P	Medically Underserved Areas/Populations

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	**Definition**
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NABCI	North American Bird Conservation Initiative
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDEQ	North Carolina Department of Environmental Quality
NCDNCR	North Carolina Department of Natural and Cultural Resources
NCDOT	North Carolina Department of Transportation
NCDWR	North Carolina Division of Water Resources
NCEI	National Center for Environmental Information
NCFA	North Carolina Forestry Association
NCFS	North Carolina Forest Service
NCGS	North Carolina Geological Survey
NCNHP	North Carolina Natural Heritage Program
NCOSA	North Carolina Office of State Archaeology
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants for Source Categories
NGA	Natural Gas Act
NGO	Non-governmental organizations
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Application
NOI	*Notice of Intent to Prepare and Environmental Impact Statement for the Planned MVP Southgate Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings*
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	**Definition**
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSA	noise sensitive area
NSF/ANSI	National Sanitation Foundation/American National Standards Institute
NSPS	New Source Performance Standards
NSR	New Source Review
NSW	Nutrient Sensitive Waters
NURE	National Uranium Resource Evaluation
NWI	National Wetlands Inventory
NWS	National Weather Service
O_3	Ozone
OEP	Office of Energy Projects
OGI	optical gas imaging
PA	Programmatic Agreement
Pb	Lead
PCB	polychlorinated biphenyl
PEM	palustrine emergent
PF	Pre-filing
PFO	palustrine forested
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIR	potential impact radius
PM	Particulate matter
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
ppb	parts per billion
ppm	parts per million
Project	Southgate Project
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PSS	palustrine scrub-shrub
PTE	potential-to-emit
RCNM	Roadway Construction Noise Model

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	**Definition**
RHA	River and Harbors Act of 1899
RMP	risk management plan
RR	Resource Report
RRBA	Roanoke River Basin Association
RV	Recreational vehicle
SAAC	Significant Ambient Air Concentration
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
Secretary	Secretary of the Commission
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMPE	South Mist Pipeline Extension
SO_2	sulfur dioxide
SPCC Plan	Spill, Prevention, Control, and Countermeasures
SPL	Sound Pressure Level
SWAP	Source Water Assessment Program
THPO	Tribal Historic Preservation Officer
Tpy	tons per year
Transco	Transcontinental Gas Pipe Line Company LLC
TRC	TRC Solutions, Inc.
TSS	total suspended solids
U.S.	United States
U.S.C.	United States Code
UDP	Unanticipated Discovery Plans
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VAC	Virginia Administrative Code
VADCR	Virginia Department of Conservation and Recreation
VADCR-DNH	Virginia Department of Conservation and Recreation, Division of Natural Heritage
VADEQ	Virginia Department of Environmental Quality
VADGIF	Virginia Department of Game and Inland Fisheries

TECHNICAL ACRONYMS AND ABBREVIATIONS

Abbreviation	**Definition**
VADGMR	Virginia Division of Geology and Mineral Resources
VADH	Virginia Department of Health
VADH-ODW	Virginia Department of Health Office of Drinking Water
VADHR	Virginia Department of Historic Resources
VADMME	Virginia Department of Mines, Minerals, and Energy
VADOF	Virginia Department of Forestry
VADOT	Virginia Department of Transportation
VaNLA	Virginia Natural Landscape Assessment
VdB	velocity decibel
VOC	volatile organic compounds
VSAT	very small aperture terminal
WEG	Wind erodibility groups
WQC	Water Quality Certification
WS	Water Supply
Yards	contractor and storage yards
ZCC	Zones of Critical Concern
ZPC	Zones of Peripheral Concern

EXECUTIVE SUMMARY

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this draft Environmental Impact Statement (draft EIS) to fulfill the requirements of the National Environmental Policy Act (NEPA), under Title 40 Code of Federal Regulations (CFR) Parts 1500-1508, and the Commission's regulations at 18 CFR Part 380. On November 6, 2018, Mountain Valley Pipeline, LLC (Mountain Valley),[1] filed an application with the FERC, under Section 7(c) of the Natural Gas Act (NGA) and Part 157 of the Commission's regulations, requesting authorization to construct and operate certain interstate natural gas facilities in Virginia and North Carolina.

The FERC is the federal agency responsible for authorizing interstate natural gas transmission facilities under the NGA, and is the lead federal agency for preparation of this draft EIS in compliance with the requirements of NEPA.[2] The United States (U.S.) Army Corps of Engineers (COE) Norfolk and Wilmington Districts, and the U.S. Department of the Interior Fish and Wildlife Service (FWS) Virginia and North Carolina Field Offices participated as cooperating agencies in preparation of the draft EIS. A cooperating agency has jurisdiction by law or has special expertise with respect to environmental resource issues associated with a project.[3]

PROPOSED ACTION

The Southgate Project (Southgate Project or Project) would involve the construction and operation of 73.7 miles of underground natural gas transmission pipeline and associated aboveground facilities in Virginia and North Carolina. Mountain Valley also proposes to construct and operate a new compressor station (Lambert Compressor Station) in Virginia; four new meter stations; interconnects and taps; four pig launchers and receivers at three locations; eight main line valves; and four cathodic protection beds. Associated with construction of the proposed facilities would be contractor yards, staging areas, temporary extra workspaces, and access roads.

In general, as described by Mountain Valley, the purpose and need for the Southgate Project is to meet the specific requests for natural gas transportation service of its anchor shipper, Dominion Energy (formerly PSNC Energy), a local natural gas distribution company. Mountain Valley states that the Project will provide additional firm natural gas transportation services for Dominion Energy to meet its growing supply needs via interconnections with the under construction Mountain Valley Pipeline project in southern Virginia and the interstate pipeline of East Tennessee Natural Gas Transmission, LLC (East Tennessee) in North Carolina to two new delivery points on the Dominion Energy distribution system in Rockingham and Alamance Counties, North Carolina. The Project would have the capacity to transport 375 million cubic feet of gas per day.

1 Mountain Valley is a joint venture between affiliates of EQT Corporation and NextEra Energy, Inc.
2 40 CFR Part 1501.5.
3 40 CFR Part 1501.6.

PUBLIC INVOLVEMENT

On May 3, 2018, Mountain Valley filed a request with the FERC to initiate the Commission's pre-filing environmental review process for the Project. On May 15, 2018, the FERC staff granted Mountain Valley's request and established pre-filing docket number, PF18-4-000, to place information related to the Project into the public record. The intent of our[4] pre-filing process is to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before an application is filed.

During pre-filing, Mountain Valley sponsored three open house meetings held at various locations throughout the Project areas to explain their Project to the public. Representatives of the FERC staff also attended those open house meetings to answer questions from the public about our environmental review process. A total of about 300 people attended the open houses.

On August 9, 2018, the Commission issued a Notice of Intent (NOI) to Prepare an Environmental Impact Statement for the Planned MVP Southgate Project, and Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions. The NOI was published in the *Federal Register* on August 15, 2018, and mailed to more than 1,100 interested parties on our environmental mailing list for the Project. The NOI briefly described the Project, summarized the FERC's environmental review process, provided a preliminary list of issues identified by us, invited comments on the environmental issues that should be addressed in the draft EIS, listed the dates, times, and locations of three public scoping sessions, and established a closing date for receipt of comments of September 10, 2018.

The scoping sessions were held in Reidsville and Haw River, North Carolina and Chatham, Virginia between August 20 and 23, 2018. About 100 people in total attended the sessions; with 68 people providing verbal comments. During the scoping period, we received a total of 137 comments on the Project; all comments are in the Commission's public record. Transcripts of the scoping sessions were placed into the public record for this proceeding.[5]

The most common comments we received were on project need. The Commission's role in reviewing the details of any project is to make a determination of public convenience and necessity. The Commission bases its decisions on financing, rates, market demand, gas supply, environmental impact, and other issues concerning a proposed project. The forthcoming Commission order for the Project will address need. We also received numerous comments regarding impacts on water quality, socioeconomics, and health and safety. These resources are addressed in the draft EIS.

During the pre-filing period, Mountain Valley assessed numerous route alternatives. Mountain Valley adopted 101 route alternative segments and/or minor route variations into its proposed Project design for various reasons, including landowner requests, avoidance of sensitive

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4 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

5 See FERC eLibrary Accession Numbers 20180921-4000, 20181004-4006, and 20181004-4007. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter the numbers above in the "Numbers: Accession Number" field.

environmental resources (such as archaeological sites or wetlands), avoidance of areas of steep terrain or side slopes, and engineering considerations.

PROJECT IMPACTS AND MITIGATION

Construction and operation of the Project could result in impacts on environmental resources, including geology, soils, groundwater, surface water, wetlands, vegetation, wildlife, fisheries, special-status species, land use, visual resources, socioeconomics, cultural resources, air quality, noise, and safety. In section 3 of this draft EIS, we include an evaluation of alternatives to the Project, including the No-Action Alternative, system alternatives, and route alternatives. In section 4.13, we assess the cumulative impacts of the Project added to other known actions within the same geographic area and in the same timeframe.

We evaluate the impacts of the Project, taking into consideration Mountain Valley' proposed avoidance, minimization, and mitigation measures. Our analysis of impacts on environmental resources is summarized below and is discussed in detail in section 4 of this draft EIS. Where necessary, we recommend additional mitigation measures to reduce impacts on specific resources. Section 5.2 of this draft EIS contains a compilation of our recommended mitigation measures.

Geology and Soils

The overall effects of Project construction and operation on topography and existing geologic conditions would be minor. Primary impacts would be limited to construction activities and would include temporary disturbance resulting from grading and trenching operations. After completion of construction activities, topography and associated drainages in areas of temporary disturbance would be returned to pre-construction contours and elevations to the extent practicable.

The Project pipeline would cross parcels owned by the East Alamance Quarry, a crushed stone aggregates operation, for approximately 230 feet near milepost (MP) 66.8. Mountain Valley has adjusted the pipeline route on these parcels to reduce impacts on planned or future mining activities. At its nearest point, the proposed alignment would be 430 feet from disturbed quarry areas and Mountain Valley has committed to working with the East Alamance Quarry regarding landowner easement agreements to further minimize impacts. Therefore, we conclude that the Project would not significantly impact or be impacted by the East Alamance Quarry.

We received comments regarding the presence of uranium deposits in the Project vicinity in Pittsylvania County. The nearest commercially viable uranium deposit is 3.5 miles north of the Lambert Compressor Station, and concentrations of uranium in sediment, soils, shallow bedrock, and groundwater near the Project workspace are comparable to concentrations in the conterminous U.S. Further, uranium is generally not highly mobile in the environment, and Mountain Valley would implement its *Erosion and Sediment Control Plan* (E&SC Plan) to address fugitive dust mitigation, stormwater control, and erosion and sediment control measures.

With the implementation of Mountain Valley's best management practices (BMPs), we conclude that impacts on geological resources would be adequately minimized.

During and following construction, the potential for soil erosion would be minimized through the use of erosion controls and revegetation measures as described in FERC's *Upland Erosion Control, Revegetation and Maintenance Plan* (Plan). To further minimize soil erosion, the Project would follow BMPs included in Mountain Valley's E&SC Plan and *Winter Construction Plan*. To address inadvertent spills of hazardous materials or petroleum products during construction, or in the event of an unanticipated discovery of existing contaminated media, Mountain Valley would implement its *Spill, Prevention, Control, and Countermeasures Plan* and *Unanticipated Discovery of Contamination Plan* to minimize potential impacts on soils.

Groundwater, Surface Waterbody Crossings, and Wetlands

The Project would not cross any sole source aquifers or principal source aquifer areas. No wellhead protection areas were identified within the Project area. Prior to construction, Mountain Valley would identify any private wells and springs near construction workspaces that are used for potable water on affected properties. As described in the Project's *Water Resources Identification and Testing Plan*, Mountain Valley would offer pre-construction and post-construction water quality testing for water supply wells located within 150 feet of Project workspaces. We are recommending that prior to construction Mountain Valley provide additional information on private water wells or springs, including the well's or springs' status, use, distance from construction workspace, and any proposed measures to minimize or avoid impacts on the private water wells or springs.

In general, the watersheds crossed by the Project contain development consistent with a rural environment. We expect that the water quality and biota within the Project area streams are largely reflective of the degree of upstream development. The Project would require 224 crossings of waterbodies, 3 of which are major waterbodies. The Project crossings would follow the FERC *Wetland and Waterbody Construction and Mitigation Procedures* as modified by Mountain Valley (referred to as Mountain Valley's Procedures) and the E&SC Plan. Mountain Valley would use Horizontal Direction Drill (HDD) crossings at the Dan River and the Stony Creek Reservoir. Mountain Valley's *HDD Contingency Plan* would ensure that drill operations are monitored and adjusted to avoid potential inadvertent returns of drilling fluid to the ground surface, and if one should occur, that the release would be contained to the extent practicable and remediated. Conventional bore crossings are proposed at Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek due to the potential presence of federal or state listed aquatic species in these systems. All other crossing would be completed using dry-ditch methods (dam-and-pump or flume method) to minimize in-stream construction and surface water impacts. In addition, we are recommending that Mountain Valley provide additional site-specific information regarding its proposed waterbody crossing plans.

The Project crosses the Dan River which is listed on the Nationwide Rivers Inventory by the National Park Service; the Banister River which is a potential Blueway river (a state-designated recreational water trail); and the Sandy River which is a potential Virginia Scenic River. The Dan River would be crossed by the HDD method to avoid impacts on the river. The Sandy River and Banister River would be crossed using a dry-ditch crossing method (e.g. dam-and-pump or flume) and would experience minor short-term impacts during construction. Mountain Valley would implement its Procedures to minimize impacts and work with state agencies regarding effects to recreational boaters.

The Project is not expected to permanently affect surface or ground water resources. Though temporary impacts would result from the Project, with implementation of BMPs and mitigation proposed by Mountain Valley, as well as our recommendations, we conclude the Project would not significantly affect water resources.

Mountain Valley made numerous modifications to its proposed route to avoid and reduce wetland crossings and impacts; however, construction of the Project would impact 26.8 acres of wetlands. Most of these impacts would be temporary and short-term. The Project's operational right-of-way would affect 5.9 acres of wetlands, including the conversion of 0.1 acre of palustrine scrub-shrub (PSS) wetland to palustrine emergent (PEM) wetland, and 4.4 acres of palustrine forested (PFO) wetlands to PSS and PEM wetlands. While adverse and long-term impacts on wetlands would occur, the Project would not result in any loss of wetlands. With adherence to Mountain Valley's Procedures and the implementation of BMPs and mitigation proposed by Mountain Valley, we conclude the Project would not significantly affect wetlands. In addition, the COE could require Mountain Valley to offset unavoidable impacts on wetlands through the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands through implementation of an agency-approved *Compensatory Mitigation Plan*.

Vegetation, Wildlife, Fisheries, and Federally Listed and State-sensitive Species

The Project is located wholly within the Piedmont Region and areas that have been heavily used as cropland; however, many of these areas have regrown into successional forests. Managed or developed land classes include agricultural land, commercial, industrial, and residential areas. These land classes represent about 21 percent of the proposed land that would be required for the Project. Of the approximately 94 percent of vegetated areas within the Project footprint, the majority (about 49 percent) consists of forested upland, followed by herbaceous/scrub-shrub upland (about 35 percent); less than 2 percent of the pipeline Project area is within wetland vegetation communities.

The primary effect of pipeline facility construction would be cutting, clearing, and/or removal of existing vegetation. The majority of vegetation affected by construction of the Project would be upland forested land, which would result in long-term impacts. To minimize forest fragmentation and edge effects, Mountain Valley has collocated about 54 percent (40 miles) of the pipeline route with existing linear corridors. Following construction, Mountain Valley would seed the construction workspace and allow natural succession to revegetate temporary workspaces disturbed by construction in accordance with the FERC Plan and Mountain Valley's Procedures. To control the spread of noxious weed species within the Project area, Mountain Valley developed an *Exotic and Invasive Plant Species Control Plan* in coordination with state agencies. Given the high level of collocation with existing, maintained rights-of-way through the majority of large forested areas crossed by the proposed pipeline route, and Mountain Valley's commitment to restore disturbed areas, we conclude that impacts on vegetation, including the spread of invasive species, would be adequately minimized.

The temporary and permanent loss and/or conversion of habitat and the general disturbance created by the use of construction equipment would impact wildlife. This impact would vary depending on the type and quantity of habitat affected and the ability of species to leave Project work areas and successfully utilize adjacent habitats. Constructing the Project may result in limited mortality of less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates, which may not be able to relocate from the immediate construction area. We have recommended conditions to minimize potential impacts on migratory birds, bald eagles, and colonial rookeries.

The Project would cross 21 perennial waterbodies containing fisheries of special concern. Constructing and operating the Project could temporarily impact fisheries and aquatic resources. Mountain Valley would adhere to all federal and state permit conditions, including those regarding the minimization of impacts on fisheries of special concern (adhering to recommended work windows for in-water construction). Based on our review of the potential impacts and mitigation measures, including our recommendations, we conclude that constructing and operating the Project would not significantly impact wildlife, terrestrial habitats, migratory birds, or fisheries and aquatic resources.

Federal agencies are required by the Endangered Species Act (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. There are five federally listed threatened or endangered species, two species of concern, and one species that is proposed as threatened that could potentially be affected by the Project. We have determined that the Project would not likely adversely affect these species, and we are asking the FWS to consider this draft EIS as our Biological Assessment for the Project. We have included a recommendation that restricts construction until our ESA consultation with the FWS is completed.

Land Use

The primary land uses affected by construction would be forested/woodland and open land. Agricultural, silviculture, industrial/commercial, and residential would make up the remaining 21 percent of land types affected during construction. As currently designed, 19.2 acres of residential land would be affected by construction of the pipeline and use of access roads. Mountain Valley prepared and would adhere to site-specific *Residential Construction Plans* for 36 residential structures currently identified as within 25 feet of construction work areas or where a plan was requested by a landowner or agency. No occupied residences would be removed to construct the pipeline. We are recommending that Mountain Valley provide evidence of landowner concurrence with the site-specific *Residential Construction Plans* for four locations where construction work areas, or new temporary access roads, would be within 10 feet of a residence at MPs 67.3, 67.8, 67.9, and 72.9.

The Project would cross the Mountains-to-Sea Trail, a North Carolina state trail, at MP 69.8. The trail/road would be crossed by conventional bore resulting in no direct impacts on the trail or its use. In general, recreation areas and special use areas crossed by the Project are expected to experience some temporary impacts during construction, such as clearing of trees, noise, dust, and limited access which may prevent or curtail recreational activities within construction areas.

Socioeconomics and Transportation

The Project may affect the socioeconomic character of communities near the proposed facilities. These potential impacts include temporary population increases, new employment opportunities, increased demand for housing and public services, impacts on tourism and local businesses, transportation impacts, environmental justice, and revenues associated with sales and payroll taxes. Mountain Valley would work with local fire departments, police departments, and emergency first responders to discuss any Project needs, including traffic assistance and emergency response preparedness. The communities in the Project area have adequate public service infrastructure to meet the potential needs of non-local workers who relocate temporarily. Therefore, we conclude that the Project would not have significantly impact public services.

Our review of available studies indicates that the Project is not likely to have a significant adverse impact on property values. There may be a potential benefit to the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables Project-specific materials, room rentals, and sales tax. However, these benefits would generally be temporary and minor. Although low income and minority populations exist within the Project area, the Project would not have a disproportionately high and adverse environmental or human health impact on minority or low income populations.

Cultural Resources

Mountain Valley conducted cultural resources surveys through June 2019 and identified a total of 65 archaeological sites and 161 historic architectural sites within the direct area of potential effect. Of the archaeological sites, 39 were evaluated as not eligible for the National Register of Historic Places (NRHP), 19 were assessed as potentially eligible or unevaluated, 3 require additional investigations before a determination of eligibility can be made, and 4 are of unknown eligibility. Of the historic architectural sites, 118 were evaluated as not eligible, 7 are potentially eligible or unevaluated, 31 are unknown or have incomplete assessments, 2 should be treated as eligible, 1 is eligible, and 2 are listed in the NRHP. No further work was recommended for the sites not eligible for the NRHP.

We recommend avoidance or additional evaluation investigations for the potentially eligible or unevaluated sites and avoidance or mitigation was recommended for the listed or eligible sites. If the Project is approved, the Commission would not authorize construction until the National Historic Preservation Act (NHPA) compliance process has been completed.

Air Quality and Noise

Air quality impacts associated with construction of the Project would include emissions from construction equipment, fugitive dust, and open burning. Such air quality impacts would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. Operational emissions would be generated by the Lambert Compressor Station, as well as minimal emissions from maintenance blowdowns and incidental leaks from the pipeline and four interconnects. Mountain Valley would comply with all applicable federal requirements and associated air permits to minimize effects on air quality in the area. As a result, we conclude that the Project would not result in a significant impact on local or regional air quality.

Noise sensitive areas (NSA) near the construction areas may experience an increase in perceptible noise, but the effect would be temporary and localized. Operational noise impacts would be limited to areas near the aboveground facilities, primarily the Lambert Compressor Station. Noise impacts on NSAs due to operation of the pipeline, meter stations, and compressor station would be negligible to barely perceptible. However, we have included a recommendation for Mountain Valley to verify the actual noise levels from operation of the compressor station at full load. For construction of the Project's proposed aboveground facilities, nighttime work would be conducted for specific situations related to safety, permit compliance, or other non-typical circumstances. Noise levels due to 24-hour construction of the Lambert Compressor Station would be below the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. However, noise levels due to 24-hour construction of the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects would all be above the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. Mountain Valley would develop a *Nighttime Construction Noise Management Plan* before nighttime construction is required at the compressor station or meter stations. This plan would list the noise levels from the selected nighttime equipment at the nearest NSAs. If resulting noise is above 55 dBA L_{dn}, the plan would identify specific noise mitigation, such as noise barriers, quieter equipment, or partial equipment enclosures that would reduce noise levels to under 55 dBA L_{dn}. We are recommending that Mountain Valley file this plan prior to nighttime construction. Based on our analyses, mitigation measures proposed, and our recommendation, we conclude that operation of the Project would not result in significant noise impacts on residents and the surrounding communities.

Reliability and Safety

The Project would be designed, constructed, operated, and maintained to meet the U.S. Department of Transportation's (DOT) *Minimum Federal Safety Standards* in 49 CFR 192 and other applicable federal regulations. These regulations include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

Mountain Valley would follow federal safety standards for pipeline class locations based on population density. The DOT regulations are designed to ensure adequate safety measures are implemented to protect all populations. We conclude that Mountain Valley's compliance with applicable design, construction and maintenance standards, and DOT safety regulations would be protective of public safety.

Cumulative Impacts

We analyzed cumulative impacts of the Project, in addition to other projects that may occur within the same area of geographic scope and timeframe. The other projects we examined include FERC-jurisdictional natural gas transportation projects; non-jurisdictional project-related facilities; other energy projects; mining operations; transportation or road projects; and commercial/residential/industrial and other development projects.

Most of the impacts resulting from construction and operation of the Project would be temporary and localized, contained within the right-of-way and extra workspaces, and when added to the impacts of other projects are not expected to result in significant cumulative impacts. However, some long-term cumulative impacts would occur in forested wetlands and forested uplands regarding vegetative communities and associated wildlife habitats. Given the Project BMPs, design features, and mitigation measures that would be implemented; and the federal and state laws and regulations protecting resources, and permitting requirements, we conclude that when added to other past, present, and reasonably foreseeable future actions, cumulative impacts on environmental resources within the geographic scopes affected by the Project would not be significant.

Alternatives Considered

As required by NEPA and Commission policy, we identified and evaluated reasonable alternatives to the Project to determine whether the implementation of an alternative would be environmentally preferable to the proposed action. An alternative would be environmental preferable if it offers a significant environmental advantage over the proposed action. Based on our findings that no other alternative would meet the purpose of the Project, be technically and economically feasible, and provide a significant environmental advantage, we conclude that the proposed Project is the preferred alternative than can meet the Project purpose.

MAJOR CONCLUSIONS

We determined that, for most resources, the construction and operation of the Project would result in limited adverse environmental impacts. This determination is based on our review of the information provided by Mountain Valley and further developed from environmental information requests; field reconnaissance; scoping; literature research; alternatives analyses; and contacts with federal, state, and local agencies, and other stakeholders. We conclude that approval of the Project would result in some adverse environmental impacts, but these impacts would be reduced to less-than-significant levels through implementation of our recommendations and Mountain Valley's proposed avoidance, minimization, and mitigation measures. The following factors were also considered in our conclusions:

- about 39 miles, or about 52.5 percent, of the 73.7-mile pipeline route would be constructed adjacent to existing rights-of-way;
- Mountain Valley would minimize impacts on natural and cultural resources during construction and operation of the Project by implementing the FERC Plan and Mountain Valley's Procedures, its E&SCP, and other Project-specific plans (e.g., *Unanticipated Discovery of Historic Properties and Human Remains Plan*, *HDD Contingency Plan*, *Spill Prevention Control and Countermeasures Plan*, *Exotic and Invasive Species Control Plan*, *Traffic Management Plan*, and *Landslide Mitigation Plan*);
- the FERC staff would complete the process of complying with section 7 of the ESA prior to construction;
- the FERC staff would complete the NHPA compliance process;
- Mountain Valley would comply with all applicable federal requirements and associated air and noise regulatory requirements during construction and operation of the Project; and

- an environmental inspection program and a third-party monitoring oversight program would be implemented to ensure compliance with the mitigation measures that become conditions of the FERC authorization.

In addition, we recommend that the Project-specific impact avoidance, minimization, and mitigation measures that we have developed (included in this draft EIS as recommendations) be attached as conditions to any Certificate of Public Convenience and Necessity issued by the Commission for the Project. These recommended mitigation measures are presented in section 5.2 of the draft EIS.

1.0 INTRODUCTION

In accordance with the Natural Gas Act (NGA, Title 15 United States Code [U.S.C.] § 717), the Federal Energy Regulatory Commission (FERC or Commission) is responsible for deciding whether to authorize the construction and operation of interstate natural gas transmission facilities. The National Environmental Policy Act (NEPA, 42 U.S.C. § 4321 et seq.) requires that the Commission consider the environmental impacts of a proposed project prior to making a decision. The Commission's natural gas program's environmental staff[1] has prepared this draft Environmental Impact Statement (EIS) so that the FERC can comply with NEPA, and to assess the potential environmental impacts that could result from the construction and operation of the Southgate Project (Project), as proposed by Mountain Valley Pipeline, LLC (Mountain Valley)[2] in Docket No. CP19-14-000.

On November 6, 2018, Mountain Valley filed an application with the FERC pursuant to Section 7(c) of the NGA, as amended. Mountain Valley is seeking a Certificate of Public Convenience and Necessity (Certificate) to construct, install, own, operate, and maintain a new interstate natural gas pipeline and ancillary facilities in Virginia and North Carolina. Mountain Valley's application was assigned Docket No. CP19-14-000.[3] We[4] issued a Notice of Application for the Project on November 19, 2018, and the notice appeared in the *Federal Register* (FR) on November 26, 2018.

Mountain Valley's Southgate Project would involve the construction and operation in Virginia and North Carolina of the following:

- about 73.7 miles of new 24-inch and 16-inch-diameter natural gas pipeline in Pittsylvania County, Virginia, and Rockingham and Alamance Counties, North Carolina;
- one new compressor station (Lambert Compressor Station) totaling about 28,915 International Organization for Standardization (ISO) horsepower (hp) in Pittsylvania County, Virginia;
- four interconnects or tie-ins with facilities operated by Mountain Valley, East Tennessee Natural Gas, LLC (East Tennessee), and Dominion Energy (formerly PSNC Energy); and

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1 Commission staff was assisted in the preparation of this EIS by a third party environmental contractor, Cardno.

2 Mountain Valley is a joint venture between affiliates of EQT Midstream Partners, LP; NextEra Energy US Gas Assets, LLC; WGL Midstream, Inc.; RGC Midstream, LLC; and Con Edison Gas Midstream, LLC. Southgate Project facilities would be operated by an affiliate of the EQT Corporation.

3 Previous to the filing of Mountain Valley's application, the Southgate Project was under pre-filing environmental review by the FERC staff in Docket No. PF18-4-000.

4 "We," "us," or "our" refers to the environmental staff in FERC's Office of Energy Project; Division of Gas, Environment and Engineering.

- ancillary facilities including pig[5] launchers and receivers, mainline block valves (MLV), and cathodic protection beds.

The Project would be designed to transport 375 million cubic feet per day [MMcf/d]) of natural gas. The Project is described in more detail in section 2.0.

1.1 PURPOSE AND NEED

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA at 40 CFR 1502.13 recommends that an EIS should briefly address the underlying purpose and need for a project. In general, as described by Mountain Valley, the purpose and need for the Southgate Project is to meet the specific requests for natural gas transportation service of its anchor shipper, Dominion Energy, a local natural gas distribution company. Mountain Valley states that the Project will provide additional firm natural gas transportation services for Dominion Energy to meet its growing supply needs via interconnections with the under construction Mountain Valley Pipeline project in southern Virginia and the interstate pipeline of East Tennessee in North Carolina to two new delivery points on the Dominion Energy distribution system in Rockingham and Alamance Counties, North Carolina.

The Commission's role in reviewing the details of any project is to make a determination of public convenience and necessity. The Commission bases its decisions on financing, rates, market demand, gas supply, environmental impact, and other issues concerning a proposed project. The Commission has developed a "Certificate Policy Statement"[6] that established criteria for determining whether there is a need for a proposed project and whether the proposed project would serve the public interest. The Commission decision, in its Order, would review the need for the Project.

During the scoping comment period, we received comments regarding the potential for Mountain Valley to further expand the Project and eventually export natural gas. We do not have any information in the record to support this contention. Mountain Valley states in its application that it did not design its facilities to transport natural gas to a liquefied natural gas (LNG) export terminal. The nearest LNG export terminal to the terminus of the Project would be the existing Cove Point LNG terminal on the Chesapeake Bay in Calvert County, Maryland, about 190 miles away. There is no direct connection from the Project terminus in Alamance County, North Carolina to the Cove Point terminal. Mountain Valley stated that it does not intend to seek permission to export natural gas overseas as LNG from the U.S. Department of Energy.

1.2 PURPOSE AND SCOPE OF THIS EIS

Our principal purposes in preparing this EIS are to:

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5 A "pig" is a device used to clean or inspect the interior of a pipeline.

6 See *Certification of New Interstate Natural Gas Pipeline Facilities*, 88 FERC ¶ 61,227 (1999), clarified in 90 FERC ¶ 61,128, and further clarified in 92 ¶ 61,094 (2000).

- identify and assess the potential direct, indirect, and cumulative impacts on the natural and human environment that would result from the construction and operation of the proposed Project;
- describe and evaluate reasonable alternatives to the proposed Project that would avoid or minimize adverse impacts on environmental resources;
- recommend mitigation measures, as necessary, that could be implemented by Mountain Valley to reduce impacts on specific environmental resources; and
- encourage and facilitate involvement by the public and interested agencies in the environmental review process.

This EIS addresses topics including Project alternatives; geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. This EIS describes the affected environment as it currently exists and analyzes the environmental consequences of the proposed Project. This EIS also presents our conclusions and recommended mitigation measures.

Our description of the affected environment is based on a combination of data sources, including desktop resources such as scientific literature and regulatory agency reports, information from resource and permitting agencies, scoping comments, field data collected by Mountain Valley and its consultants, and our own site visits. Our resource specialists independently fact-checked data submitted by the applicant. As of June 2019, Mountain Valley has field surveyed about 92 percent of all the Project facilities.

On October 26, 2018, we sent letters to various federal and state resource agencies that might have an interest in cooperating in the production of the draft EIS for the Project, as defined in 40 CFR 1501.6.[7] The U.S. Army Corps of Engineers (COE), Norfolk and Wilmington Districts, and the U.S. Fish and Wildlife Service (FWS) agreed to be cooperating agencies. See section 1.3.2 below for details on cooperating agency roles and responsibilities. A cooperating agency has jurisdiction by law over part of a project and/or has special expertise with respect to environmental issues. Cooperating agencies play a role in the environmental analyses of this project and assist in developing mitigation plans or other measures. They participate in the NEPA process by reviewing the application and related materials, and by reviewing administrative drafts of the overall EIS or the specific portions related to agency permitting or special expertise. The roles and the scope of the actions of FERC and the cooperating agencies in the Project review processes are described in the sections below.

[7] The FERC sent letters to the U.S. Army Corps of Engineers District Officers in Norfolk, Virginia and Wilmington, North Carolina; Region 4 of the U.S. Environmental Protection Agency in Atlanta, Georgia; the Virginia and North Carolina Field Offices of the U.S. Fish and Wildlife Service; the Virginia Department of Mines, Minerals, and Energy; the Virginia Department of Conservation and Recreation; the Virginia Department of Game and Inland Fisheries; the Virginia Department of Environmental Quality, the Virginia Marine Resources Commission; the North Carolina Wildlife Resources Commission; and the North Carolina Department of Environmental Quality; requesting their participation as cooperating agencies.

1.2.1 Federal Energy Regulatory Commission

Originally known as the Federal Power Commission when first created by Congress in 1920, the agency was reorganized and renamed the FERC under the administration of President Jimmy Carter. The FERC is an independent federal regulatory agency[8] that regulates the interstate transportation of natural gas, among other industries, in accordance with the NGA of 1938 as amended.

Pursuant to the Energy Policy Act of 2005 (EPAct) Section 313(b)(1), the FERC is the lead federal agency for the coordination of all applicable federal authorizations. Thus, the FERC is the lead federal agency for preparation of this draft EIS to comply with NEPA, as described in the CEQ's regulations at 40 CFR 1501.5 and in keeping with the May 2002 Interagency Agreement with other federal agencies.[9]

As the lead federal agency, we prepared this EIS to assess the environmental impacts that could result from constructing and operating the Project. This document was prepared in compliance with the requirements of the CEQ's regulations at 40 CFR 1500-1508, and the FERC's regulations for implementing NEPA at 18 CFR 380. As applicable, this EIS is also intended to fulfill the cooperating federal agencies obligations under NEPA (see section 1.3.2 below) and to support subsequent conclusions and decisions made by the Commission and the cooperating agencies.

The Commission will consider the findings contained herein, as well as non-environmental issues, in its review of Mountain Valley's application. The identification of environmental impacts related to the construction and operation of the Project, and the mitigation of those impacts, as disclosed in this EIS, would be components of the Commission's decision-making process. The Commission would issue its decision in an Order. If the Project is approved, the Commission would issue a Certificate to Mountain Valley. The Commission may accept the application in whole or in part, and can attach engineering and environmental conditions to the Order that would be enforceable actions to assure that the proper mitigation measures are implemented prior to a project going into service.

1.2.2 U.S. Army Corps of Engineers

Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (later incorporated into the Clean Water Act [CWA] 33 U.S.C. § 1344) the COE was given authority over the discharge of dredged or fill materials into the Waters of the United States. The Project would cross two COE Districts, including the Norfolk District and Wilmington District.

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8 The decision makers at the agency are five Commissioners (at full contingent) appointed by the President and confirmed by the Senate. The decisions of the Commission cannot be challenged by the President or Congress, but may be reviewed in federal court.

9 May 2002 Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction With the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certificated by the Federal Energy Regulatory Commission, signed by the FERC, Advisory Council on Historic Preservation, CEQ, USDA, U.S. Department of the Army, U.S. Department of Commerce, U.S. Department of Energy, EPA, U.S. Department of Interior, and Department of Transportation.

The COE's regulations for permits under Section 10 of the Rivers and Harbors Act (RHA, 33 U.S.C. § 403) can be found at 33 CFR 322, while regulations for permits under Section 404 of the CWA are at 33 CFR 323, and processing of permits is at 33 CFR 325. The Norfolk and Wilmington Districts agreed to be a cooperating agencies in the production of this draft EIS. As a cooperating agency, the COE may adopt this EIS for the purposes of exercising its regulatory authorities. Mountain Valley filed its permit applications with the Norfolk and Wilmington Districts of the COE on November 30, 2018.

The District Engineer cannot make a decision on a permit application until the requirements of NEPA are fulfilled. After the publication of an EIS, the COE authorization can be issued under the Nationwide Permit Program. In communications with FERC staff, representatives of the COE indicated that individual COE Districts would not finalize their permit processes for the Project until after the FERC has documented completion of the National Historic Preservation Act (NHPA) Section 106 and Endangered Species Act (ESA) Section 7 consultations. We expect that the Project would be considered by the COE under its Nationwide Permit Program. However, if it is determined that an Individual Permit with the COE is required, and once the COE determines a permit application to be complete, it would issue a public notice. In accordance with EPAct Section 313(d), the COE would submit or summarize relevant information used in its permit decision, potentially including comments received on its notice, and file this information with the FERC, as the Commission is the keeper of the consolidated record for the proceedings. If an individual permit is required, as an element of its review, the COE must consider whether the proposed Project 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 in light of the overall purpose of the Project.

1.2.3 U.S. Fish and Wildlife Service

The mission of the FWS is to conserve, protect, and enhance, fish, wildlife, and plants and their habitats. Towards that goal, the FWS works to enforce federal wildlife laws, protect endangered species, manage migratory birds, conserve habitats including wetlands, and restore fisheries. The FWS cares for about 150 million acres in more than 500 National Wildlife Refuges.

The FERC, as the lead federal agency for the Project 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 the Project. If it is determined that the Project may adversely affect federally listed species or their critical habitats, the FERC staff must prepare a biological assessment (BA) to identify the nature and extent of adverse impacts, and to recommend measures that would avoid, reduce, or mitigate impacts on habitats and/or species. At this time, we have not determined that the Project would adversely affect a listed species; however, we are submitting this draft EIS as our BA and requesting informal consultation with the FWS under Section 7 of the ESA. The consultation process under Section 7 of the ESA is outlined in regulations at 50 CFR 402. The ESA is further discussed in sections 1.4.2.4 and 4.7 of this EIS.

In addition, the FWS has statutory authority and responsibilities for enforcing the Migratory Bird Treaty Act (MBTA), the Fish and Wildlife Improvement Act, and the Fish and Wildlife Act. The FWS may issue permits under the MBTA in accordance with 50 CFR 21. On

March 30, 2011, the FERC and the FWS entered into a Memorandum of Understanding (MOU) regarding compliance with the MBTA. On December 22, 2017, the Department of the Interior (DOI) issued a memorandum (M-37050) analyzing whether the MBTA prohibits the accidental or incidental take of migratory birds. In M-37050, the DOI clarified their position stating that the MBTA does not prohibit incidental take. The MBTA is further discussed in sections 1.4.2.5 and 4.6 of this EIS. The FWS also has the authority to issue permits under the Bald and Golden Eagle Protection Act (BGEPA), in accordance with regulations at 50 CFR 22. The BGEPA is further discussed in sections 1.4.2.1 and 4.5 of this EIS.

1.3 PUBLIC REVIEW

On May 3, 2018, Mountain Valley filed a request to enter into the Commission's pre-filing (PF) environmental review process for the Project. The FERC granted Mountain Valley's request on May 15, 2018, and established pre-filing Docket No. PF18-4-000. Prior to and during the pre-filing process, Mountain Valley contacted federal, state, and local governmental agencies to inform them about the Project and discuss Project-specific issues. Mountain Valley also contacted affected landowners, to inform them about the Project, and to obtain permission to perform environmental surveys. Mountain Valley developed a public participation plan (Public, Stakeholder, and Agency Participation Plan[10]) to facilitate stakeholder communications and make information available to the public and regulatory agencies.[11] This public participation plan established a single point of contact within Mountain Valley for the public or agencies to call or e-mail with questions or concerns; a publicly accessible website (http://www.mvpsouthgate.com/) with information about the Project (including maps) and Project status; and regular newsletter mailings for affected landowners and other interested parties.

Between June 25 and 28, 2018, after entering into PF, Mountain Valley hosted three informal open house meetings along the planned Southgate route. The purpose of the open houses was to provide affected landowners, elected and agency officials, and the general public with information about the Project and to give them an opportunity to ask questions and express their concerns. A total of about 300 people attended the open house meetings. We participated in the open houses to provide information regarding the Commission's environmental review process to interested stakeholders and to listen to stakeholder concerns.

On August 9, 2018, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned MVP Southgate Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions* (NOI). The NOI was published in the FR on August 15, 2018 (83 FR 40509) and sent to over 1100 parties on our environmental mailing list, which included federal and state resource agencies; elected officials; environmental groups and non-governmental organizations (NGO); Native Americans and Indian tribes; potentially affected landowners; local libraries and newspapers; and other stakeholders who had

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[10] Mountain Valley's Public, Stakeholder, and Agency Participation Plan was included as appendix 1-L to Resource Report 1 in its November 06, 2018, application. The Public, Stakeholder, and Agency Participation Plan can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

[11] Mountain Valley's public participation plan was filed with its May 3, 2018, request to the FERC to initiate the pre-filing review process.

indicated an interest in the Project. The NOI also announced the date, time, and location of public scoping sessions sponsored by the FERC in the Project area. Issuance of the NOI opened a 30-day formal scoping period that ended September 10, 2018.

The FERC sponsored three public scoping sessions in the Project area during the formal scoping period to provide the public with the opportunity to comment verbally on the Project. The scoping sessions were held in Reidsville, North Carolina on August 20, 2018; Chatham, Virginia on August 21, 2018; and Haw River, North Carolina on August 23, 2018. A total of 68 attendees provided verbal comments at the sessions. Transcripts of each scoping session were placed into the FERC's public record for the Project and are available for viewing electronically through the Internet.[12]

The issuance of our NOI for the Project on August 9, 2018, marked the start of the official scoping period. During the official scoping period, from August 9, 2018 to September 10, 2018, we received 137 comments. This includes: 4 letters from Indian tribes; 5 letters from state agencies; 1 letter from county governments; 14 letters from NGOs; 9 letters from affected landowners; 36 letters from the general public; and 68 verbal comments transcribed at the public scoping meetings. We also received 65 form letters.

During the PF period, the FERC staff visited the Project area and inspected portions of the pipeline route. In addition, the FERC staff attended meetings with representatives of Mountain Valley, the North Carolina Wildlife Resources Commission (NCWRC) on June 25, 2018; the COE Wilmington District, FWS Raleigh Field Office, and North Carolina Department of Environmental Quality (NCDEQ) in separate meetings on June 27, 2018; a conference call with the Virginia State Historic Preservation Officers (SHPO) on August 7, 2018; a meeting with COE Norfolk District on August 8, 2018; and a meeting with Virginia Department of Environmental Quality (VADEQ), Virginia Marine Resources Commission, Virginia Department of Conservation and Recreation (VADCR), Virginia Department of Game and Inland Fisheries (VADGIF) on August 8, 2018. Notes summarizing these meetings were placed into the FERC's public record for the proceeding.[13]

During the PF period, FERC staff participated in conference calls on an approximately bi-weekly basis with representatives from Mountain Valley and federal and state governmental agencies to discuss the progress of the Project and issues. Summaries of the telephone calls were placed in the public record.

Mountain Valley filed its formal application for the Project on November 6, 2018. On November 19, 2018, the FERC issued a Notice of Application (NOA). Our notice stated there are two ways to become involved in the Commission's review of the Project. One way is to become an intervenor, or party to the proceeding. This is a legal position that carries certain rights and

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[12] To access the public record for this proceeding, go to the FERC's Internet website (http://www.ferc.gov), click on "Documents & Filings" and select the "eLibrary" feature. Click on "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the field (i.e., PF18-4, or CP19-14). Select an appropriate data range.

[13] The notes for these meetings can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter the following numbers in the "Numbers: Accession Number" field – 20180712-3035, 20120230-3013, 20180830-3014, 20180830-3052

responsibilities, and gives parties legal standing to request a rehearing and challenge a Commission decision in court. The second way to participate is to file comments with the Secretary of the Commission (Secretary). The comment period to respond to the NOA closed on December 10, 2018. Between the filing of Mountain Valley's application, and December 31, 2018, 42 parties filed for intervenor status. However, five additional entities filed late motions to become intervenors after the comment period closed, including the Monacan Indian Nation and Sappony Tribe. The Commission has granted these requests for late intervention.

From the time we accepted Mountain Valley's request to start the PF process on May 3, 2018 up to the filing of the application on November 6, 2018, we received 181 comment letters on the record about the Project. Table 1.3-1 lists the environmental topics raised in comments received on the Project during the scoping period. The most common comments were on Project need, water quality, socioeconomics, and health and safety topics. Table 1.3-1 also includes comments received after the formal scoping period ended on September 10, 2018, including relevant environmental comments raised by individuals requesting to be intervenors in the Commission's Southgate proceeding.

TABLE 1.3-1

Issues Identified During the Scoping Process for the Southgate Project a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
General	**62**	
Project purpose and need	40	1.1
Coordination of NEPA reviews by cooperating agencies		1.2
Pre-filing process		1.3
Compliance with environmental permits		1.4
Right-of-way width		2.3.1
Depth of cover		2.4.1.3
Non-jurisdictional facilities		2.2
Timeframes and project schedules		2.5
Future project expansion		2.8
Mitigation measures		4.0
Production of natural gas from the Marcellus Shale		1.1
Exportation of natural gas		1.1
Alternatives	**25**	**3.0**
No-action alternative		3.2
Energy conservation		3.1.1
Consideration of renewable energy alternatives		3.1.1
Use of other natural gas systems		3.3
Consideration of alternative routes to avoid populated areas and sensitive resources		3.4

TABLE 1.3-1

Issues Identified During the Scoping Process for the Southgate Project a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
Geology	**24**	**4.1**
Potential for seismic activity (earthquakes)		4.1.4.1, 4.1.4.2
Uranium deposits		4.1.4.8
Impacts from landslides		4.1.4.4, 4.1.4.5
Impacts from blasting		4.1.4.6,
Impacts due to construction in karst terrain		4.1.4.5
Soils	**(included in Geology)**	**4.2**
Erosion and sediment control		4.2.2
Contaminated soils		4.2.7
Water Quality and Aquatic Resources	**51**	**4.3, 4.6**
Impacts on groundwater and drinking water supplies		4.3.1.
Impacts on septic systems		4.8.3.1
Dewatering methods		2.4.1.5, 4.3.2.7.
Waterbody crossings		2.4.1.10, 4.3.2
Impacts of horizontal directional drill crossings		2.4.1.10, 4.3.2
Impacts on the pipeline from a flood event		4.1.4.7
Hydrostatic Testing		4.3.2.6
Impacts on fishery resources		4.6.2
Wetlands	**(included in Water and Aquatic resources)**	**4.4**
Impacts on wetlands		4.4.2
Vegetation	**20**	**4.5**
Impacts on forest		4.5.4.3
Revegetation of areas cleared during construction		4.5.4
Plans for invasive species control		4.5.3, 4.5.4.1
Wildlife	**20**	**4.6**
Compliance with the Migratory Bird Treaty Act		4.6.3
Impacts on wildlife from habitat removal and project construction		4.6.1.1,
Impacts on wildlife from forest fragmentation/forest edge effect		4.6.1.1
Impacts on wildlife from water contamination		4.6.5
Special Status Species	**6**	**4.6, 4.7**
Agency coordination and requirements		4.6.3, 4.7
Evaluation of potential impacts on threatened or endangered species and their habitat		4.7.1

TABLE 1.3-1

Issues Identified During the Scoping Process for the Southgate Project a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
Land Use	**31**	**2.8, 4.8**
Impacts on future development plans		2.8, 4.8.3.2
Impacts on crop yields and loss of agricultural land		4.8.1.1
Eminent domain and compensation process		4.8.2
Impacts on existing residences and structures during construction and operation		4.8.3
Impacts on recreational and special interest areas		4.8.4
Impacts on landowners from removal of lands from conservation programs with potential tax implications		4.8.4.2
Hazardous waste sites		4.8.5
Visual impacts of cleared rights-of-way & aboveground facilities		4.8.6
Socioeconomics	**44**	**4.9**
Employment opportunities for local contractors and laborers and increased tax revenues		4.9.1, 4.9.7
Impacts on community public safety resources		4.9.3
Impacts on environmental justice communities		4.9.8, 4.13
Impacts on homes, businesses, and land values		4.9.5
Impacts on ability to obtain and afford homeowner's insurance		4.9.5
Impacts on tourism		4.9.6
Impacts on transportation infrastructure (roads, highways, railroads) and traffic		4.9.4
Cultural Resources	**22**	**4.10**
Tribal consultations		4.10.1.2
Impacts on culturally and historically significant properties		4.10.2
Cultural Attachment		4.10.1.3
Air Quality	**20**	**4.11.1**
Consistency with the emissions limits and standards		4.11.1.2
Impacts on air quality		4.11.1.7
Climate Change and Greenhouse gas emissions		4.11.1
Noise	**(included in Air Quality)**	**4.11.2**
Potential noise impacts on residences, schools and wildlife		4.11.2
Reliability and Safety	**40**	**4.12**
Emergency response		4.12.1
Remote detection of pipeline leaks		4.12.1

TABLE 1.3-1

Issues Identified During the Scoping Process for the Southgate Project a/

Issues	Percentage of all Comments Received b/	EIS Section Addressing Issue
Safety and reliability of constructing and maintaining the pipeline		4.12.1
Pipeline damage from blasting		4.12.1, 4.1.4.6
Pipeline damage from accidental third-party or terrorist actions		4.12.4
Pipeline Safety Standards in rural areas		4.12.1
Cumulative Impacts	**5**	**4.13**
Analysis of cumulative impacts		4.13

a/ Percentages will not sum to 100 percent because most letters include more than one category

During the public scoping period, we received comments regarding if there is a need for the additional natural gas supplies in North Carolina. Others questioned the need for the Project on the grounds that it would not directly benefit the citizens of Virginia. Some stated that construction and operation of the Project would be a burden on affected landowners. In this draft EIS, we partly address these comments in either the Alternatives section (see section 3) or in the Socioeconomics section (see section 4.9).

1.4 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

The FERC and the other federal agencies that must make a decision on the Project are required to comply with numerous federal statutes in addition to NEPA, including the BGEPA, Clean Air Act (CAA), CWA, ESA, MBTA, NHPA, and RHA. Each of these statutes has been taken into account in the preparation of this draft EIS, as discussed below.

Table 1.4-1 lists the major federal, state, and local permits, approvals, and consultations for construction and operation of the Project. The table also provides the dates, or anticipated dates, when Mountain Valley commenced, or anticipates commencing, formal permit and consultation procedures.

TABLE 1.4-1

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Southgate Project

Agency	Permit/ Consultation/ Regulations	Submittal Date	Receipt Date
Federal			
FERC	Certificate under Section 7 of the Natural Gas Act, 18 CFR 380	November 6, 2018 application filed with the FERC	Pending
Advisory Council on Historic Preservation (ACHP)	Comment on undertakings under Section 106 of the NHPA; 36 CFR 800	Pending – FERC staff's assessment of adverse effects	Pending
COE - Norfolk District, Wilmington District	33 CFR 320 & 322; and Section 404 of CWA, 33 CFR 323 and Joint Permit Application under Section 401 of CWA	Application submitted November 30, 2018, Additional information submitted January 17, February 8, 2019	Pending
FWS – Virginia and North Carolina Field Offices	Consultations under Section 7 of ESA, 50 CFR 402; BGEPA, 50 CFR 22; and MBTA, 50 CFR 21	Informal communications initiated by Applicant May 2018; Notice of FERC filing sent November 6, 2018; Reports submitted February 20, 25, 2019. Freshwater mussel survey report provided May 16, 2019	Pending
State of Virginia			
VADEQ – Water Division	Section 401 CWA – Water Quality Certificate and Water Protection Permit for impacts on non-404 regulated wetlands or waters	November 30, 2018	Pending
	Section 402 CWA National Pollutant Discharge Elimination System (NPDES) Permit – Construction Stormwater Permit	Pending	Pending
VADEQ – Air Division	Article 6 Minor New Source Air Quality Permit	November 8, 2018	Pending

TABLE 1.4-1

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Southgate Project

Agency	Permit/ Consultation/ Regulations	Submittal Date	Receipt Date
Virginia Department of Conservation and Recreation	State listed species consultation	May 2018; Notice of FERC filing sent November 6, 2018; Additional information sent February 20, 21, 25, 2019	Pending
Virginia Department of Historic Resources	Section 106 NHPA Consultations	Reports submitted November 6, 2018; February 22, 2019; March 25, 2019	February 13, 2019 comments on first draft survey reports. May 10, 2019 comments on first testing report May 16, 2019 comments on second testing report
Virginia Department of Transportation	Road bonds and crossing permits under Code of Virginia 33.1-12	Application filed first quarter 2017; Updated information Pending	Pending
Virginia Marine Resources Commission	Submerged Lands License under Virginia Administrative Code 4 VAC 20-120-10 ET SEQ	November 30, 2018	Pending
Virginia Department of Game and Inland Fisheries	State listed species consultation	May 2018 Freshwater mussel survey report provided May 16, 2019	Pending
State of North Carolina			
NCDEQ - Division of Water Resources	Joint Permit Application under Section 401 of CWA; Isolated/non-404 wetlands and water permit	Application submitted November 30, 2018; Additional information submitted January 17, February 8, 2019	Denial on June 3, 2019. Resubmittal Pending
	Jordan Lake Watershed Major Variance	February 8, 2019	Denial on June 3, 2019. Resubmittal Pending
NCDEQ – Division of Energy, Mineral and Land Resources	General Permit NCG010000 to discharge stormwater under the NPDES for Construction Activities	Submittal Pending	Pending
NCDEQ – Natural Heritage Program	State listed species consultation	May 2018; February 20, 25, 2019	Pending

TABLE 1.4-1

Major Environmental Permits, Licenses, Approvals, and Consultations Applicable to the Southgate Project

Agency	Permit/ Consultation/ Regulations	Submittal Date	Receipt Date
North Carolina Wildlife Resources Program	Listed Species Consultations, Fish and Wildlife Coordination Act, North Carolina Environmental Policy Act	May, August 10, 20 & 31, September 20, 2018	Pending
North Carolina Department of Natural and Cultural Resources	Section 106 NHPA Consultations	Reports submitted November 6, 2018; March 13, 2019; March 28, 2019	December 20, 2018 comments on first draft survey reports April 15, 2019 comments on first testing report May 7, 2019 comments on Addendum 1 survey report
North Carolina Department of Transportation	Road bonds and crossing permits	Submittal Pending	Pending

1.4.1 Bald and Golden Eagle Protection Act

The BGEPA (16 U.S.C. § 668) was originally passed by Congress in 1940, and amended in 1962 to also protect golden eagles. The 1972 amendment increased penalties for violation of the Act. The 1978 amendment allowed taking of golden eagle nests that interfere with resource development, with permission from the Secretary of the Interior. 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. This EIS discusses compliance with the BGEPA in section 4.5.

1.4.2 Clean Air Act

Congress originally passed the CAA (42 U.S.C. § 85) in 1963, and made major revisions to it in 1970, 1977, and 1990. The primary objective of the CAA, as amended, is to establish federal standards for various pollutants from both stationary and mobile sources, and to provide for the regulation of polluting emissions via state implementation plans. In addition, the CAA was established to prevent significant deterioration in certain areas where air pollutants exceed national standards and to provide for improved air quality in areas that do not meet federal standards (nonattainment areas).

The U.S. Environmental Protection Agency (EPA) has regulatory authority under the CAA. Section 309 of the CAA directs the EPA to review and comment in writing on environmental impacts associated with all major federal actions. Section 4.11.1 of this EIS has a detailed discussion of air quality issues.

1.4.3 Clean Water Act

The CWA got its legislative start as the Federal Water Pollution Control Act of 1948, but the Act was amended and renamed in 1972. The CWA (33 U.S.C. § 1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the Waters of the United States and regulating quality standards for surface waters. Section 404 of the CWA outlines procedures by which the COE can issue permits for the discharge of dredged or fill material into Waters of the United States, including wetlands. The EPA also independently reviews Section 404 CWA applications and has veto power for permits issued by the COE.

Mountain Valley submitted its original Section 404 CWA permit applications to the Norfolk and Wilmington Districts of the COE on November 30, 2018.

The EPA has also delegated Water Quality Certification (WQC) under CWA Section 401 and National Pollutant Discharge Elimination System (NPDES) permitting under CWA Section 402 to state agencies (i.e., the VADEQ and the NCDEQ) in states crossed by the Project. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. The NPDES permit program controls stormwater discharges.

Mountain Valley submitted its Section 401 applications to the VADEQ and the NCDEQ in November 30, 2018. On June 3, 2019, NCDEQ issued a letter of denial of the Section 401 Water Quality Certification for the Project. Mountain Valley continues to coordinate and would reapply with NCDEQ. Section 4.3 of this draft EIS discusses impacts on water resources that may be applicable to compliance with the CWA.

1.4.4 Endangered Species Act

The Endangered Species Preservation Act of 1966 was amended in 1969, and evolved into the ESA (16 U.S.C. § 1531-1544) in 1973. Section 7 of the ESA states that any project authorized, funded, or conducted by any federal agency (in this case, 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…." As previously stated, the FERC, as the lead federal agency for the Project, 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 the Project. Additional information regarding compliance with the ESA can be found in section 4.7.

1.4.5 Migratory Bird Treaty Act

The MBTA (16 U.S.C. § 703-712) dates back to 1918, but has been amended many times. 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 MBTA 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. This draft EIS discusses compliance with the MBTA in section 4.6.

1.4.6 National Historic Preservation Act

Congress passed the NHPA in 1966 (54 U.S.C. § 3001 et seq.), which has been amended multiple times, most recently in 2014. The NHPA created the National Register of Historic Places (NRHP), established the Advisory Council on Historic Preservation (ACHP), and directed states to appoint SHPOs.

Section 101(d)(6) of the NHPA states that properties of religious and cultural importance to an Indian tribe may be determined to be eligible for the NRHP. In meeting our responsibilities under the NHPA, and our tribal trust obligations, the FERC consulted on a government-to-government basis with Indian tribes that may have an interest in the Project and its potential effects on traditional cultural properties. The current status of government-to-government consultations regarding the identification of historic properties in the area of potential effect (APE) that may have religious or cultural significance to Indian tribes is further discussed in section 4.10.

Section 106 of the NHPA requires the FERC to take into account the effects of its undertakings on historic properties, and afford the ACHP an opportunity to comment. Historic properties include prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance that are listed or eligible for listing on the NRHP. In accordance with the regulations for implementing Section 106 at 36 CFR 800, the FERC, as the lead agency, is required to consult with the appropriate SHPOs, interested Indian tribes, and other consulting parties; identify historic properties in the APE; assess project effects on historic properties; and resolve adverse effects. Mountain Valley, as a non-federal party, is assisting the FERC in meeting its obligations under Section 106 by preparing the necessary information and analyses as allowed under Part 800.2(a)(3). However, the FERC remains responsible for all final determinations. The status of our compliance with the NHPA is summarized in section 4.10 of this EIS.

1.4.7 Federal, State, and Local Permits, Licenses, Approvals, and Consultations

In some cases, Mountain Valley would obtain applicable state and local permits or authorizations, as required under specific state and county laws and regulations in order to allow the Project to move forward. The 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 the

FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by the FERC.[14]

A list of major federal and state environmental permits, approvals, and consultations for the Project is provided in table 1.4-1. Mountain Valley would be responsible for obtaining all permits and approvals required to construct and operate the Project, regardless of whether or not they appear in this table.

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14 *See* 15 U.S.C. § 717r(d) (2019) (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, 243 (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).

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

The Project would involve the construction and operation of a welded-steel underground natural gas transmission pipeline and associated aboveground facilities in Virginia and North Carolina. Figure 2.1-1 provides an overview map of the Project. Detailed maps showing the proposed pipeline and facility locations are provided in appendix B.1. The Project facilities would be installed using the methods described in section 2.4.

The Project would consist of 73.7 miles of 16-inch and 24-inch-diameter natural gas transmission pipeline. Aboveground facilities would consist of a new compressor station (Lambert Compressor Station) in Virginia; four new meter stations; four interconnects; four pig launchers and receivers at three locations; eight MLVs; and four cathodic protection beds.

The pipeline would be constructed of steel and installed underground for the entire length using the methods described in sections 2.4.2 and 2.4.3. The basic functions of the various aboveground facilities are summarized in the following bullets, and additional details are provided below in sections 2.1.1 and 2.1.2.

2.1.1 Pipeline Facilities

The proposed Project includes 73.7 miles of new natural gas pipeline in Virginia and North Carolina. Locations of the pipeline facilities are described in table 2.1-1. Pipeline facilities include the following:

- installation of 0.5 mile of 24-inch-diameter natural gas transmission pipeline (H-605) located in Pittsylvania County, Virginia;
- installation of 30.4 miles of 24-inch-diameter natural gas transmission pipeline (H-650) located in Pittsylvania County, Virginia, and Rockingham County, North Carolina; and
- installation of 42.8 miles of 16-inch-diameter natural gas transmission pipeline (H-650) located in Rockingham and Alamance County, North Carolina.

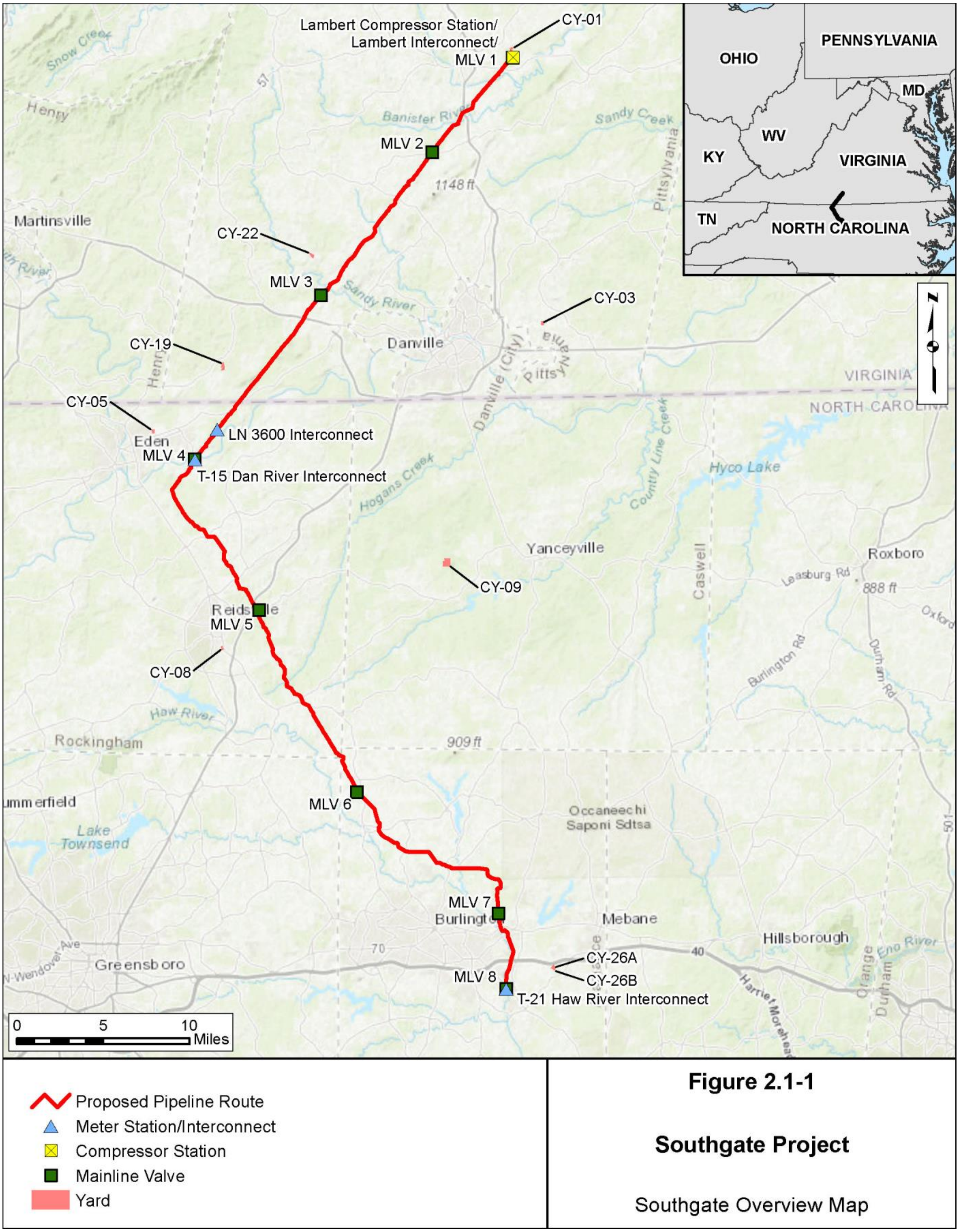

Figure 2.1-1

Southgate Project

Southgate Overview Map

TABLE 2.1-1

Southgate Project Pipeline Facilities

Milepost	Pipeline / Diameter	County, State	Approximate Length (miles)
0.0 – 0.5	H-605 Pipeline / 24-inch	Pittsylvania, VA	0.5
0.0 – 26.1	H-650 Pipeline / 24-inch	Pittsylvania, VA	26.1
26.1 – 30.4	H-650 Pipeline / 24-inch	Rockingham, NC	4.3
30.4 – 52.6	H-650 Pipeline / 16-inch	Rockingham, NC	22.2
52.6 – 73.2	H-650 Pipeline / 16-inch	Alamance, NC	20.6
	Total (H-605 and H-650 pipelines)		**73.7**

The pipeline route begins with a new 0.5-mile pipeline (H-605) that would interconnect the Mountain Valley Pipeline to the Lambert Compression Station. From the Lambert Compressor Station, the proposed Southgate pipeline (H-650) would proceed 73.2 miles through Pittsylvania County, Virginia, and Rockingham and Alamance Counties, North Carolina. The pipeline has been designed to transport 375 million MMcf/d of natural gas. The maximum allowable operating pressure (MAOP) for the new pipeline would be about 1,440 pounds per square inch gauge (psig). For 39 miles (52.5 percent) of the route, the Project would be collocated with existing utility corridors and rights-of-way (see table 2.1-2).

TABLE 2.1-2

Summary of Pipeline Collocated with Existing Rights-of-Way for the Southgate Project *a/*

Collocation Type	Distance (miles)	Percent
Overhead Power Lines/Electric Transmission Line Rights-of-Way	12.4	16.8
Pipeline Rights-of-Way	26.3	35.7
Total	**38.7**	**52.5**

a/ Not all collocated features are directly adjacent to the pipeline.

2.1.2 Aboveground Facilities

Mountain Valley proposes to construct a new compressor station (Lambert Compressor Station) in Pittsylvania County, Virginia; four new meter stations; four interconnects; four pig launchers and receivers at three locations; and eight MLVs. The basic functions of the aboveground facilities are summarized below, and additional details regarding each facility is provided below in table 2.1-3.

- Compressor stations use engines to maintain pressure within the pipeline in order 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 metering and pig launcher/receiver facilities 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.

- Interconnects (meter stations) measure the volume of gas removed from or added to a pipeline system. Most meter stations consist of above and below ground piping within a small graveled area with small building(s) that enclose the measurement equipment. Mountain Valley would construct and operate interconnects within the Lambert Compressor Station, at customer delivery points, and at interconnections with other interstate transmission systems.

- MLVs 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. MLVs would be installed within the operational rights-of-way of the pipeline right-of-way.

- Launchers and receivers are facilities where internal pipeline cleaning and inspection tools, referred to as "pigs," can inserted or retrieved from the pipeline. Pig launchers/receivers consist of an aboveground group of piping within the pipeline right-of-way or other aboveground facility boundaries.

- 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. Mountain Valley identified locations where groundbeds would extend off of the pipeline right-of-way for a short distance.

TABLE 2.1-3

Aboveground Facilities for the Southgate Project

Facility	County, State	MP	Description
Lambert Compressor Station (with Lambert Interconnect, MLV 1 and pig launcher)	Pittsylvania, VA	0.0	A proposed new 28,915-hp compressor station consisting of two natural gas turbine-driven compressors housed in one compressor building that would take natural gas from the proposed H-605 pipeline at the Lambert Interconnect and discharge into the H-650 pipeline. This location would include the Lambert Interconnect, MLV 1 and a 24-inch pig launcher.
Lambert Interconnect (within Lambert Compressor Station, with pig launcher)	Pittsylvania, VA	0.0	New interconnecting meter station at the Lambert Compressor Station to receive gas from the Mountain Valley Pipeline system via the H-605 pipeline and discharge into the Lambert Compressor Station.
LN 3600 Interconnect	Rockingham, NC	28.2	New interconnecting meter station to take gas from the existing East Tennessee LN 3600 and discharge into the Southgate pipeline.
T-15 Dan River Interconnect (with MLV 4 and pig launcher and receiver)	Rockingham, NC	30.4	New interconnecting meter station to take gas from the Southgate pipeline and discharge into the existing Dominion Energy T-15 Dan River facility. This location would include MLV 4 and a 16-inch pig launcher and 24-inch receiver
T-21 Haw River Interconnect (with MLV 8 and pig receiver)	Alamance, NC	73.1	New interconnecting meter station to take gas from the Southgate pipeline and discharge into the existing Dominion Energy T-21 Haw River facility. This location would include MLV 8 and a 16-inch pig receiver.
MLV 1 (within Lambert Compressor Station at Lambert Interconnect)	Pittsylvania, VA	0.0	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping at the Lambert Compressor Station connection to H-650 pipeline.
MLV 2	Pittsylvania, VA	7.4	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping within the permanent easement north of Dry Fork Road.
MLV 3	Pittsylvania, VA	18.3	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping within the permanent easement south of Pine Lake Road.
MLV 4 (within T-15 Dan River Interconnect)	Rockingham, NC	30.4	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping at the T-15 Dan River Interconnect.
MLV 5	Rockingham, NC	42.2	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping within the permanent easement south of Hwy 158.
MLV 6	Alamance, NC	55.1	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping within the permanent easement south of Gilliam Church Road.

TABLE 2.1-3

Aboveground Facilities for the Southgate Project

Facility	County, State	MP	Description
MLV 7	Alamance, NC	68.2	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping within the permanent easement south of Indian Village Trail.
MLV 8 (within T-21 Haw River Interconnect)	Alamance, NC	73.1	Mainline valve with aboveground valve operators, risers, blowdown valves, and crossover piping at the T-21 Haw River Interconnect.

The local service provider would provide primary telecommunication services to aboveground facilities. Mountain Valley would install very small aperture terminal (VSAT) equipment at the Lambert Compressor Station, meter stations, and MLV sites for backup telecommunications service. Mountain Valley proposes to install an 80-foot communication tower at the Lambert Compressor Station.

Electrical services from the local distribution company would be installed at meter stations, MLVs, and cathodic protection locations. The primary power source at the Lambert Compressor Station would be natural gas generators; however, backup electrical service would be provided by the local distribution company.

2.1.3 Cathodic Protection

Cathodic protection units would include both aboveground and underground components. These units are installed to decrease or prevent corrosion of the pipe, by running a low electric current. Cathodic protection equipment could consist of underground negative connection cables, linear anode cable systems, aboveground junction boxes, and rectifiers. Mountain Valley is still evaluating locations to install cathodic protection at four locations along the Project; however, the preferred locations are provided in table 2.1-4.

TABLE 2.1-4

Cathodic Protection Units for the Southgate Project

MP	County, State	Cathodic Protection Type
10.8	Pittsylvania, VA	Conventional
21.1	Pittsylvania, VA	Conventional
44.9	Rockingham, NC	Conventional
60.3	Alamance, NC	Conventional

According to Mountain Valley, the permanent footprint of conventional anode and cable type cathodic surface groundbeds would require additional right-of-way with dimensions of about 50 feet wide and 500 feet long to be located perpendicular to the pipeline right-of-way. Surface groundbeds would not require a temporary workspace adjacent to the permanent footprint.

2.2 NON-JURISDICTIONAL 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 Commission. As such, FERC has no authority or jurisdiction over the siting, permitting, licensing, construction, or operation of these facilities. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities (e.g., a power plant at the end of a FERC-jurisdictional pipeline) or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated as a result of the Certification of the proposed. These facilities are addressed below.

The non-jurisdictional facilities associated with the Project would include installation of aboveground and underground powerlines and telecommunications from existing nearby power poles to the meter stations, Lambert Compressor Station, MLVs, and cathodic protection groundbeds. These extensions would range from 50 feet to 1,684 feet in length. Telecommunications would be radio and/or cellular provided by the local telecommunications provider with VSAT service as a backup. Dominion Energy would make minor improvements to its Dan River and Haw River delivery points in conjunction with the Project. Impacts associated with these non-jurisdictional facilities are addressed in section 4.13.

2.3 LAND REQUIREMENTS

Construction of the Project would disturb about of 1,513.9 acres of land. This includes the pipeline construction right-of-way, permanent right-of-way, additional temporary workspaces (ATWS), aboveground facilities, contractor and storage yards (yards), cathodic protection areas, and new and improved access roads (see table 2.3-1). Operation of the Project would use about 450 acres, which includes the permanent pipeline easements, aboveground facilities, and permanent access roads.

TABLE 2.3-1

Land Requirements for the Southgate Project

Project Component/State	Land Affected During Construction (acres)	Land Affected During Operation (acres)
PIPELINE FACILITIES		
Virginia		
H-605 Pipeline Right-of-Way	7.7	2.7
H-650 Pipeline Right-of-Way	395.2	149.2
North Carolina		
H-650 Pipeline Right-of-Way	728.9	273.8
Pipeline Total	***1,131.8***	***425.7***
ABOVEGROUND FACILITIES		
Virginia		
Lambert Compressor Station/Interconnect/MLV 1	19.0	11.7
MLV 2 and 3	<0.1	<0.1
North Carolina		
LN3600 Interconnect	4.7	0.7
T-15 Dan River Interconnect/MLV 4	5.2	0.8
MLV 5, 6, and 7	<0.1	<0.1
T-12 Haw River Interconnect/MLV 8	1.4	0.6
Aboveground Facilities Total	**30.4**	**13.9**
CONTRACTOR YARDS		
Virginia	98.9	0.0
North Carolina	149.8	0.0
Contractor Yards Total	**248.7**	**0.0**
ACCESS ROADS (acres for improvement of existing roads and new road construction)		
Virginia	36.6	2.9
North Carolina	62.4	3.4
Access Roads Total	**99.0**	**6.3**
CATHODIC PROTECTION BEDS		
Virginia	3.5	3.5
North Carolina	0.6	0.6
Cathodic Protection Groundbeds Total	**4.1**	**4.1**
Virginia Totals	**560.9**	**170.0**
North Carolina Totals	**953.1**	**280.0**
Project Totals	**1,513.9**	**450.0**

Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreage calculations for the pig launchers and receivers are included with those facilities. MLVs 1, 4, and 8 will be located within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreage calculations for MLVs 1, 4, and 8 are included with those facilities.

2.3.1 Pipelines

Mountain Valley would generally use a 100-foot-wide construction right-of-way to install the pipeline in uplands and a 75-foot-wide construction right-of-way through wetlands. Right-of-way configurations proposed by Mountain Valley for its pipeline are included in appendix B.2. Construction of the pipelines would affect a total of 1,131.8 acres, including ATWS, but excluding staging areas, yards, access roads, and cathodic protection beds. Pipeline construction would affect 402.9 acres of land in Virginia and 728.9 acres in North Carolina. The temporary work areas used during construction of the pipelines would be restored to their pre-construction condition and use after the facilities are built.

Following construction, Mountain Valley would retain a 50-foot-wide permanent right-of-way to operate the pipeline. The operational permanent easement for the pipelines would require about 425.7 acres. Operation of the pipelines would affect 151.9 acres in Virginia and 273.8 acres in North Carolina.

2.3.2 Aboveground Facilities

A total of 30.4 acres would be affected by construction of aboveground facilities. Operation of aboveground facilities would affect a total of about 13.9 acres. The temporary work areas used during construction of the aboveground facilities would be restored to their pre-construction condition and use after the facilities are built.

Construction of the new Lambert Compressor Station, Lambert Interconnect, and MLV 1 would be within the same facility on land owned by Mountain Valley and would affect 19 acres all in Pittsylvania County, Virginia. Operation of these facilities would require about 11.7 acres in total.

Construction of the remaining interconnects and MLVs would affect a total of 11.4 acres. Construction and operation in Virginia would require about 0.04 acre for MLV 2 and MLV 3. In North Carolina, construction of these facilities would require 11.4 acres, and operation would use a total of about 2.2 acres.

2.3.3 Additional Temporary Workspaces

During construction of the pipeline facilities, Mountain Valley would require ATWS in areas such as the following:

- adjacent to crossings of railroads, waterbodies, wetlands, other utilities, and at some roadways;
- construction constraints that require special construction techniques, such as horizontal directional drill (HDD) entry and exit locations;
- HDD pullbacks;
- conventional bores;
- areas requiring extra trench depth;

- timber storage areas;
- installation of erosion and sediment controls, and stormwater management to meet state regulations;
- areas with steep side slopes and difficult terrain;
- pipeline interconnects;
- areas for extra spoil storage;
- areas for temporary storage of segregated topsoil;
- locations with soil stability concerns;
- truck turnarounds;
- equipment passing lanes; and
- staging and fabrication areas.

As proposed by Mountain Valley, the Project would require 89.9 acres of ATWS in Virginia and 184.9 acres in North Carolina, affecting a total of 274.8 acres combined. ATWS would be used only during construction of the Project. After pipeline installations, all of the ATWS would be restored to their pre-construction condition and use, to the extent possible. Appendix B.3 identifies where Mountain Valley has proposed ATWS within 50 feet of a wetland or waterbody.

2.3.4 Contractor Yards

Mountain Valley would need temporary yards during construction to store pipe, materials, and equipment; set up offices; and mobilize workers. Land requirements for contractor yards proposed for temporary use during construction of the Project are provided in table 2.3-1. Depending upon the conditions at each site, Mountain Valley would clear trees, grade, modify drainage, import gravel or crushed rock, install buildings (usually pre-fabricated mobile homes), and construct internal roadways as needed. After pipeline installation, Mountain Valley would allow yards to return to pre-construction use, unless the landowner requests otherwise.

During pipeline construction, Mountain Valley would use four yards in Virginia and six yards in North Carolina (see table 2.3-2). The yards would temporarily occupy about 248.7 acres. These yards are depicted on the maps in appendix B.1.

TABLE 2.3-2

Contractor Yards for the Southgate Project

Name	Approx. MP	County	State	Municipality	Parcel	Land Use a/	Acres
CY-01	0.0 (on H-605)	Pittsylvania	VA	Chatham	VA-PI-001.000 VA-PI-002.015.CY	OL	22.2
CY-22	16.1 (1.9 miles northwest)	Pittsylvania	VA	--	VA-PI-218.CY	FW, OL	23.1 (forest to be cleared 2.9)
CY-03	20.5 (13 miles east)	Pittsylvania	VA	Danville	VA-PI-142.200.CY	FW, OL, CI	16.9 (forest to be cleared 0.1)
CY-19	24.7 (1.9 miles northwest)	Pittsylvania	VA	Cascade	VA-PI-207	OL	36.6
CY-05	28.3 (3.6 miles west)	Rockingham	NC	Eden	NC-RO-001.200.CY NC-RO-001.300.CY NC-RO-001.400.CY	CI, OL	19.8
CY-25A	38.9 (12.3 miles east)	Caswell	NC	Yanceyville	NC-CA-001.000.CY	OL	22.2
CY-25B	38.9 (12.3 miles east)	Caswell	NC	Yanceyville	NC-CA-001.000.CY	FW, OL	74.1 (forest to be cleared 0.3)
CY-08	44.6 (2.9 miles west)	Rockingham	NC	Reidsville	NC-RO-136.100.CY NC-RO-136.300.CY	OL, CI	11.5
CY-26A	71.7 (2.4 miles east)	Alamance	NC	Swepsonville	NC-AL-226.CY NC-AL-227.CY	OL	11.8
CY-26B	71.7 (2.4 miles east)	Alamance	NC	Swepsonville	NC-AL-226.CY NC-AL-227.CY	FW, OL	10.5 (forest to be cleared 0.2)
						Total	**248.7**

a/ CI = Commercial / Industrial; FW = Upland Forest / Woodland; OL = Upland Open Land; RD = Residential; WL = Wetland

2.3.5 Access Roads

Mountain Valley would mostly use existing public and private roads to gain access to its respective rights-of-way. However, many existing roads are not suitable for construction traffic.

In addition to the use of public roads, Mountain Valley would use 113 (totaling 30.2 miles) existing access roads and construct 43 new roads. Use of these 156 access roads would affect about 99 acres. Almost all of the existing access roads (107) would require improvements for pipeline construction traffic. Mountain Valley would use 22 of the access roads for permanent access to the right-of-way and aboveground facilities, including 8 existing roads and 14 new roads. Permanent use of access roads would affect 6.3 acres. Appendix B.4 identifies each road improvement proposed for the Project. Additional information regarding access roads can be found in appendix B.4 and section 4.8.1.

2.3.6 Cathodic Protection

After installation of the pipeline, Mountain Valley would install cathodic protection rectifiers and groundbeds at four sites. These facilities would affect about 4 acres for construction and operation.

2.4 CONSTRUCTION PROCEDURES

Mountain Valley would design, construct, operate, and maintain its respective pipelines and facilities in accordance with U.S. Department of Transportation (DOT) regulations under 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) and other applicable federal and state 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. Mountain Valley would also comply with the siting and maintenance requirements under 18 CFR 380.15 and other applicable federal and state regulations, including the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration. 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. Pipeline safety is discussed further in section 4.12 of this EIS.

Mountain Valley agreed to adopt the FERC's general construction, restoration, and operational mitigation measures outlined in our *Upland Erosion Control, Revegetation and Maintenance Plan* (Plan). Mountain Valley also agreed to adopt our *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures)[1] with modifications; herein referred to as Mountain Valley's Procedures. Mountain Valley requested modifications to certain requirements of the FERC Procedures and provided site-specific justifications which are further described below and in sections 4.3 and 4.4.

The Procedures require:

- that prior to construction, site-specific justifications must be filed with the Secretary, for review and written approval, for extra work areas that would be closer than 50 feet from a waterbody or wetland (Section II.A.1); and
- where pipelines parallel a waterbody, at least 15 feet of undisturbed vegetation must be maintained between the construction right-of-way and the waterbody (and any adjacent wetland), except where maintaining this offset would result in greater environmental impact (Section V.B.3.c).

[1] FERC Plan and Procedures are available on the FERC Internet website at http://www.ferc.gov/industries/gas/enviro/guidelines.asp.

Mountain Valley has requested to locate extra work areas closer than 50 feet from a waterbody in certain locations, and has requested modifications to the 15-foot buffer described above. The locations where these modifications would be located for the Project are identified in appendix B.3 and B.8. We[2] have reviewed the requested modifications and have found them acceptable.

To further reduce construction impacts, Mountain Valley has indicated that it would implement a Project-specific *Erosion and Sediment Control Plan* (E&SC Plan)[3] that outlines best management practices (BMPs) and the placement of erosion control devices (ECDs) within Project work areas in accordance with Virginia and North Carolina regulations. Mountain Valley has developed a Project-specific *Spill, Prevention, Control, and Countermeasures Plan* (SPCC Plan)[4] and an *Unanticipated Discovery of Contamination Plan*[5] in order to contain hazardous materials stored or discovered during construction of the Project.

2.4.1 General Pipeline Construction Procedures

Constructing the Project would generally be completed using typical upland overland 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 (see figure 2.4-1). These construction techniques would generally proceed in an assembly line fashion with construction crews moving down the construction right-of-way as work progresses. Mountain Valley would have two construction spreads that would each be simultaneously conducting construction activities at different locations along the route. Construction and restoration at any particular point along the pipeline route would take about 3 weeks to complete; although progress could be delayed by topography, weather, or other factors. Specialized construction methods such as side-slope construction, HDD, conventional bore, and special procedures for crossing waterbodies and wetlands would be used as needed and are described below. Construction at the Lambert Compressor Station would involve standard industrial site construction activities.

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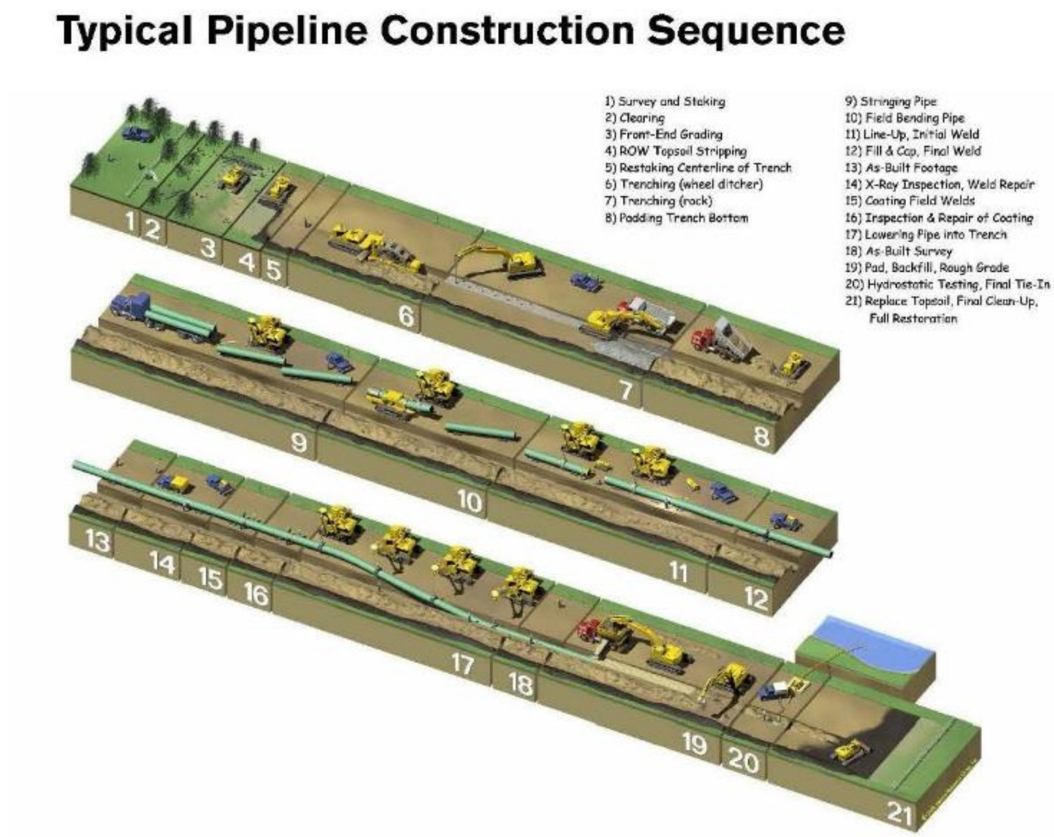
2 "We", "us", and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

3 Mountain Valley's Virginia and North Carolina draft narrative *Erosion and Sediment Control Plan* (E&SC Plan) was filed on June 21, 2019. The E&SC Plan can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190621-5150 in the "Numbers: Accession Number" field.

4 Mountain Valley's SPCC Plan was included as appendix 1-G to Resource Report 1 in its November 06, 2018, application. The SPCC Plan can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

5 Mountain Valley's *Unanticipated Discovery of Contamination Plan* was included as appendix 6-H to Resource Report 6 in its November 06, 2018, application. The *Unanticipated Discovery of Contamination Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.



Source: NRG, 2000

Typical Pipeline Construction Sequence	Figure 2.4-1 Southgate Project

2.4.1.1 Survey and Staking

The first step of construction involves engineering and land survey crews staking the limits of the construction right-of-way, the centerline of the proposed trench, ATWS, and other approved work areas. Mountain Valley would mark approved access roads using temporary signs or flagging, and the limits of approved disturbance on any access roads requiring widening. Mountain Valley would fence off environmentally sensitive areas (e.g., waterbodies and wetlands, special status species habitat, and historic properties) where the construction right-of-way may be constricted. Property markers and old survey monuments would be referenced and marked, and replaced during restoration. Mountain Valley would contact the One-Call system for each state and county to locate, identify, and flag existing underground utilities to prevent accidental damage during pipeline construction. Typically, land surveying is done using all-terrain vehicles (ATV) and pick-up trucks.

2.4.1.2 Clearing and Grading

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. The specified construction right-of-way widths would be cleared, including ATWS. Existing fences may not be removed, but new gates may be cut, and fences reinforced.

Vegetation would generally be cut or scraped flush with the surface of the ground, leaving rootstock in place where possible. Mountain Valley states that merchantable timber would be cut to useable lengths and stacked on the edge of the right-of-way to a maximum height of 4 feet with openings every 200 feet to allow the safe passage of wildlife. Typically, cut timber would be disposed in accordance with landowner wishes; unless Mountain Valley purchases the timber as part of its compensation agreements.

Mountain Valley further states that brush cleared from the construction corridor would be open burned, windrowed, chipped/mulched, or hauled off for disposal at an approved location. According to Mountain Valley, chipped brush would be blown off of the right-of-way with landowner approval. Chips would not be blown into environmentally sensitive areas (i.e., waterbodies, wetlands, and habitat for special status species). Any open burning would be conducted on a site-specific basis, in accordance with applicable state and local regulations and Mountain Valley's *Fire Prevention and Suppression Plan.*[6] Burning of cleared slash would only take place in upland areas, away from residences, waterbodies, and wetlands. Impacts on air quality during burning are discussed in section 4.11.1.

Mountain Valley's proposed timber and brush disposal methods, specifically windrowing stacking of timber along on the right-of-way and blowing chipped brush off the right-of-way without being hauled off and used for beneficial reuse by the landowner, do not comply with the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*, section III.E. Therefore, we are including a recommendation in section 4.5 requiring Mountain Valley to file revised disposal plans in accordance with the FERC Plan.

Grading would be conducted where necessary to provide a reasonably level work surface. More extensive grading, referred to as two-tone construction, would be required in uneven terrain and where the right-of-way traverses side slopes. Equipment used for clearing and grading activities could include grinding machines, motor-graders, bulldozers, track-hoes, and dump trucks.

Mountain Valley has indicated that it would separate topsoil from subsoil in residential, agricultural areas, and unsaturated wetlands. Mountain Valley would segregate at least the top 12 inches of topsoil where 12 or more inches of topsoil is present. In soils with less than 12 inches of topsoil, the entire topsoil layer would be segregated. See section 4.2 for additional information regarding topsoil segregation.

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[6] Mountain Valley's *Fire Prevention and Suppression Plan* was included as appendix 1-H to Resource Report 1 in its November 06, 2018, application. The *Fire Prevention and Suppression Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

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. Mountain Valley has committed to employing Environmental Inspectors (EIs) 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 2.4.4.

2.4.1.3 Trenching

Soil and bedrock would be removed to create a trench into which the pipeline would be placed. A track-mounted excavator/backhoe or similar equipment would be used to dig the pipeline trench. When rock is encountered, tractor-mounted mechanical rippers or rock trenchers would be used to fracture the rock prior to excavation. Blasting may be used in specific areas where hard bedrock is close to the surface. Blasting is more fully discussed in section 4.1 of this EIS.

Excavated soils would be stockpiled along the right-of-way on the side of the trench away from the construction traffic ("spoil side"). Subsoil would not be allowed to mix with the previously stockpiled topsoil. Excess rock would be trucked to approved disposal areas.

The trench would be dug at least 12 inches wider than the diameter of the pipeline and excavated to a depth of 5.5 feet to 9 feet in order to provide sufficient cover over the pipeline in accordance with DOT standards in 49 CFR 192.327 (see table 2.4-1). There would generally be 36 inches of cover over the top of the pipeline in deep soils and 18 inches of cover in areas of consolidated rock. At waterbody crossings, the pipe would be more deeply buried; with a minimum of 4 feet of cover at navigable waterways and a minimum of 2 feet of cover at waterbodies with consolidated rock. As discussed in section 4.3, the pipeline would be buried deeper than the DOT standards for several waterbodies in order to prevent exposure of the pipeline due to scour. Mountain Valley would install its uncased pipeline with a minimum of 10 feet of cover under railroads; and a minimum of 5.5 feet of cover for cased pipe under a railroad.

TABLE 2.4-1

Minimum DOT Specifications for Depth of Cover over Natural Gas Pipelines

Location a/	Normal Soil (cover depth in inches)	Consolidated Rock (cover depth in inches)
DOT PHMSA Class 1	36	18
DOT PHMSA Class 2, 3, and 4	36	24
Actively cultivated agriculture	48	24
Drainage ditches of public roads	36	24
Navigable river, stream, or harbor	48	24
Minor stream crossings	36	24

DOT PHMSA – U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
a/ As defined in 49 CFR 192.5.
Class 1: offshore areas and areas within 220 yards of a pipeline with ≤10 buildings intended for human occupancy.

Class 2:	areas within 220 yards of a pipeline with >10 but <46 buildings intended for human occupancy.
Class 3:	areas within 220 yards of a pipeline with >46 buildings intended for human occupancy and areas within 100 yards of either a building or a small, well defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period.
Class 4:	areas within 220 yards of a pipeline where buildings with four or more stories are prevalent.

2.4.1.4 Pipe Stringing, Bending, Welding, and Coating

After trenching, sections of pipe typically between 40 and 60 feet long (also referred to as "joints") would be transported to the right-of-way by truck, off-loaded by track-hoes or side-boom tractors, and strung beside the trench in a continuous line. 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.

Individual sections of pipe would be bent using a track-mounted, hydraulic pipe-bending machine to conform to the contours of the ground after the joints of pipe sections are strung alongside the trench. Where multiple or complex bends are required, bending may be conducted at the pipe fabrication factory, and the pipe would be shipped to areas pre-bent.

After the pipe joints are bent, they would be aligned, welded together into a long segment, and placed on temporary supports at the edge of the trench. Mountain Valley would use welders who are qualified according to applicable standards in 49 CFR 192 Subpart E, American Petroleum Standard 1104, and other requirements. Automated welding may be used by Mountain Valley in areas of flat terrain.

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 non-destructive method of inspecting the inner structure of welds and determining the presence of defects. Welds that do not meet the regulatory standards would be repaired or removed.

After a weld is approved, a coating crew would coat the area around the weld 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 debris. The crew would then apply the coating and allow the coating to dry. 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. Mountain Valley would repair damage to the coating before the pipeline is lowered into the trench. The welded pipe would be placed on wooden skids next to the trench.

2.4.1.5 Lowering-in and Backfilling

The trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating before the pipe is lowered into the trench. Trench dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. Trench water would be discharged through sediment removal devices in well-vegetated upland areas away from waterbodies and wetlands. The pipeline would then be lowered into the trench by side-boom tractors. Trench breakers (such as sand bags or foam) would then be installed in the trench on slopes at specified intervals to prevent subsurface water movement along the pipeline.

Sandbags may be placed on top of the pipe after it is in place at the bottom of the trench to protect it from rocks. The first 12 inches at the bottom of the trench above the pipe would be clean fill, absent of rocks. Limestone dust may be brought in and used as padding material only when other local suitable fill is unavailable. The trench would then be backfilled using the excavated material; first with subsoil, then with topsoil. Backfilling could be done by track-hoes, bulldozers, graders, or backfilling machines. A crown of soil may extend above the trench in agricultural, grasslands-rangelands, and open lands, to account for settling. Any excess soils would be spread evenly over the right-of-way.

2.4.1.6 Hydrostatic Testing

Mountain Valley would hydrostatically test the pipeline after backfilling to ensure the system is capable of withstanding the operating pressure for which it was designed. Hydrostatic testing involves filling the pipeline with water to a designated test pressure and maintaining that pressure for about 8 hours. Actual test pressures and durations would be consistent with the requirements of 49 CFR 192. Any leaks would be repaired and the section of pipe retested until the required specifications were met.

Mountain Valley has indicated that water for hydrostatic testing would be obtained from two municipal water sources. If chlorinated water is used, a dechlorination agent may be required prior to discharge, depending on the discharge location. No chemicals would be added to test water unless approved by FERC and applicable federal and state regulatory agencies. The test water would contact only new pipe. No desiccant or chemical additives would be used to dry the pipe after testing.

The pipeline would be tested in segments, and the water may be moved through each sequential segment along the route, or the water would be discharged. The hydrostatic test water would be discharged through sediment filters in vegetated uplands away from waterbodies and wetlands. Section 4.3.2 provides more information on hydrostatic testing.

2.4.1.7 Commissioning

Test manifolds would be removed and final pipeline tie-ins would be completed after hydrostatic testing. The pipeline then would be cleaned and dried using mechanical tools (pigs) that are moved through the pipeline with pressurized dry air. Pigs also would be used to internally inspect the pipeline to detect whether any abnormalities or damage exists. Any problems or concerns would be addressed as appropriate.

Pipeline commissioning would then commence. 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. Mountain Valley would not be authorized to place the pipeline facilities into service until after it has documented to the FERC that restoration activities are proceeding in a satisfactory manner, and the companies have received written permission from the Director of the Office of Energy Projects (OEP).

2.4.1.8 Cleanup and Restoration

Within 20 days of backfilling the trench (10 days in residential areas), all work areas would be graded and restored. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls would be maintained until conditions allow completion of final cleanup. Surplus construction material and debris would be removed from the right-of-way unless that landowner or land-managing agency approves otherwise and it is used for beneficial reuse. Excess rock/stone would be disposed of within the construction right-of-way with landowner approval or at an approved landfill.

After backfilling the trench, the topographic contours would be restored to their original pre-construction condition as close as possible, using graders and bulldozers; except where drainage patterns may cause erosion. Permanent erosion control features, such as slope breakers (water bars), would be installed on steep terrain. Fences and gates would be repaired. In addition, driveways and access roads would be restored to pre-construction conditions. Markers showing the location of the pipeline would be installed at fence and road crossings in order to identify the owner of the pipeline and convey emergency information in accordance with applicable governmental regulations, including DOT safety requirements. Mountain Valley would conduct restoration activities in accordance with landowner agreements, permit requirements, and recommended seeding mixes, rates, and dates in accordance with the Project's E&SC Plan.

The right-of-way would be seeded within 6 working days following final grading, weather and soil conditions permitting, although seeding would not be required in actively cultivated croplands unless requested by the landowner. Alternative seed mixes specifically requested by the landowner or required by agencies may be used. Any soil disturbance that takes place outside the permanent seeding season or any bare soil left unstabilized by vegetation would be mulched in accordance with the FERC Plan (see section 4.4).

2.4.2 Special Pipeline Construction Procedures

Special construction techniques are required when a pipeline is installed across waterbodies, wetlands, roads and railroads, foreign utilities, steep slopes, residences, agricultural lands, and other sensitive environmental resources. These procedures are further discussed as they apply to specific resources in section 4.0.

2.4.2.1 Waterbody Crossings

Waterbody crossings would be completed in accordance with Mountain Valley's Procedures and measures required in other federal or state issued permits. The Project would require 216 waterbody crossings. The waterbodies that would be crossed and the proposed crossing methods for each are listed in appendix B.5. Waterbody crossings are discussed in more detail in section 4.3.2 of this EIS.

ATWS necessary for waterbody crossings would be placed a minimum of 50 feet from the waterbody edge. The 50-foot setback would be maintained unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies (see appendix B.3 and section 4.3.2).

To prevent sedimentation caused by equipment traffic crossing through waterbodies, temporary equipment bridges would be installed across waterbodies. Bridges may include clean rock fill over culverts, equipment pads, wooden mats, free-spanning bridges, and other types of spans. Equipment bridges would be maintained throughout construction. 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 of time the bridge is in use.

Sediment barriers, such as silt fence and straw/hay bales, would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction, until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas. Trench plugs, consisting of compacted earth of similar low permeability material would be installed at the entry and exit points of wetlands and waterbodies to prevent water from the stream or wetland from moving along the trench. After backfilling, streambanks would be re-established to approximate pre-construction contours and stabilized.

The pipelines would be installed below scour depth (see section 4.3.2) for each waterbody crossed. In most cases, at least 4 feet of cover over the pipeline at waterbody crossings would be maintained; except in consolidated rock, where there would be a minimum of 2 feet of cover. Trench spoil would be placed on the banks above the high water mark for use during backfilling. In some cases, the pipeline would be coated with concrete for negative buoyancy.

The majority of waterbody crossings for the Project would be dry-ditch crossings (flume, dam-and-pump, or cofferdam). The Dan River and Stony Creek Reservoir are proposed to be crossed via an HDD; and three locations are proposed to be crossed via conventional bore including Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek. These crossing methods are briefly described below.

Flume Construction Method

The flume method is a type of dry-ditch crossing that 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 pipe 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 typically left in place during pipeline installation until trenching under the flumes, pipe installation, and final cleanup of the streambed is complete. Once the pipeline is installed, and the streambed and banks restored, the flume pipes are removed, allowing water flow to return to pre-construction conditions.

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. Temporary dams are installed across the waterbody on both the upstream and downstream sides of the construction right-of-way, usually using sandbags or plastic sheeting. Pumps are then set up at the upstream dam with the discharge line (or hoses) 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. The pipeline is then installed and the trench backfilled, allowing water flow to be re-established to pre-construction conditions. After backfilling, the dams are removed and the banks restored and stabilized.

HDD Construction Method

An HDD involves drilling a hole under the waterbody (or other sensitive feature) and installing a pre-fabricated pipe segment through the hole. Mountain Valley is proposing to use the HDD method to cross the Dan River and Stony Creek Reservoir.

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 has 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 towards the drill rig. Depending on the substrate and length, drilling and pullback can last anywhere from a few days to a few weeks. Additional information regarding the HDD method is presented in section 4.3.

Conventional Bore Method

Conventional boring consists of creating a tunnel-like shaft for a pipeline 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 bore 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. Mountain Valley is proposing to use the conventional bore method at three locations to cross Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek.

2.4.2.2 Wetland Crossings

Wetland crossings would be completed in accordance with Mountain Valley's Procedures, and other federal and state permits. About 116 wetlands would be crossed by the pipeline and 27 wetlands would be crossed by other Project components (including access roads). The wetlands that would be crossed are listed in appendix B.6 and are discussed further in section 4.3.3.

Mountain Valley would 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 (see section 4.3.3). ATWS may be required on both sides of wetlands to stage construction equipment, fabricate the pipeline, and store materials. ATWS for wetland crossings would be located 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 (see section 4.3). Mountain Valley proposes to use extra workspace within 50 feet of waterbodies and wetlands at specific locations as listed in appendix B.3.

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, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. 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 sediment runoff.

Construction equipment working in wetlands would be limited to that 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. Wetlands would be crossed by wet or dry open trench lay, or open ditch push-pull methods.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique, which 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 to "float" the pipeline into place, aided by a winch and flotation devices attached to the pipe. After the pipeline is floated into place, the floats are 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. Mountain Valley has proposed to use aggregate-filled sacks to decrease buoyancy. After the pipeline sinks into position, trench breakers are installed where necessary to prevent the subsurface drainage of water out of the wetland. Then the wetland is backfilled and cleanup completed. Where topsoil has been segregated from subsoil, the subsoil is backfilled first followed by the topsoil. Topsoil is not segregated in saturated wetlands due to the unconsolidated nature of the soils. Equipment mats and timber riprap would be removed from wetlands following backfilling.

For the proposed Project, construction through unsaturated wetlands would be similar to dry upland methods, with one exception; only one travel lane would be used. Up to 1 foot of topsoil from the trench would be segregated where hydrologic conditions allow.

2.4.2.3 Road and Railroad Crossings

The Project would cross 74 roads and four railroads. The pipeline would be installed at least 3 feet beneath all roads, and at least 10 feet below all railroads for uncased pipe (about 5.5 feet deep for cased pipe).

Construction across roads and railroads would be conducted in accordance with the permits obtained by Mountain Valley and applicable laws and regulations, including DOT safety standards. Traffic control measures would be coordinated with appropriate state and county transportation and road agencies. Mountain Valley has developed a Project-specific *Traffic Mitigation Plan,* as more fully discussed in section 4.9 of this EIS.

Railroads would be crossed with a conventional bore. In general, crossings of paved roads would also be conventionally bored, so not to disrupt traffic. The process for constructing a conventional bore crossing under roads is the same as previously described for crossing waterbodies. If a paved road is open-cut, any asphalt removed during a road crossing would be disposed of at an approved facility. Mountain Valley would not recycle used asphalt.

Most gravel, dirt, and grass roads would be crossed by the open-cut method. Traffic on roads would be maintained during construction by the use of steel plates or detours. At least one lane of the road being crossed would be kept open to traffic except for brief periods when it would be essential to close the road to install the pipeline. Road users would be notified via signage and flagmen. Most open-cut road crossings require only 1 or 2 days to complete. After pipeline installation, all open-cut road crossings would be restored to pre-construction conditions.

2.4.2.4 Residential Areas

Construction work areas would be within 25 feet of 26 residential structures. (e.g. homes, mobile homes, and cabins) Mountain Valley filed site-specific plans, as discussed in section 4.8 and provided in appendix B.7. As described in section 4.8, we encourage affected landowners to review the site-specific plans for their properties, and provide comments to the FERC in their review of this draft EIS.

Measures that would be implement to minimize impacts on residences located within 25 feet of the construction right-of-way, include, but are not limited to:

- installing temporary safety fencing for at least 100 feet on either side of the residence and maintaining it throughout active construction in the area;
- installing safety fence and temporary end caps on the pipeline at the end of each work day to prevent overnight access to the trench and pipeline;
- fencing the boundary of the construction work area to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- leaving 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;

- reducing temporary workspaces where possible;
- backfilling the trench as soon as possible after the pipe is installed; and
- completing final cleanup, grading, and installation of permanent ECDs within 10 days after backfilling the trench, weather permitting.

2.4.2.5 Foreign Utilities

The Project route crosses about 78 existing buried pipelines and other foreign utilities (including fiber optic lines, telephone lines, power lines, sewer lines, water lines, etc.) Mountain Valley would install the pipelines below existing pipelines and other foreign utilities wherever feasible. Mountain Valley would install the pipeline with at least 12 inches of clearance from any other underground utilities as required by DOT standards at 49 CFR 192.325. Larger spoil piles resulting from greater depth of excavation at the crossing of foreign utilities would be stored within ATWS at each crossing. Construction of those crossings would be monitored by Mountain Valley, and sometimes by representatives of the owner/operator of the other pipeline or utility. Appropriate safety measures would be implemented that meet the standards of the Occupational Safety and Health Administration. To ensure that existing pipelines and other foreign utilities are properly identified, and crossed without damage, the following measures would be implemented:

- contact "One-Call" to locate existing known buried pipelines and other foreign utilities;
- locate existing buried pipelines using a hand-held magnetometer or by probing, as appropriate for the conditions encountered;
- scan the edges of the right-of-way with passive inductive locating equipment;
- provide advance notice to the owner/operators of the foreign pipelines prior to construction, and allowing representatives to be present during work around their pipelines;
- not use mechanized excavation equipment within 3 feet of another buried foreign pipeline, with the excavations completed by hand shoveling;
- keep construction equipment and spoil piles off the centerline of the foreign pipeline;
- support the foreign pipeline for the length of the span exposed;
- inspect the foreign pipeline before and after the pipeline are installed;
- maintain DOT minimum separation distances;
- follow the foreign pipeline operator's requirements; and
- keep a working combustible gas indicator on-site.

2.4.2.6 Agricultural Lands

The Project would cross about 196 acres of agricultural lands. Impacts and mitigation on prime farmland soils are discussed in section 4.2 of this EIS; while impacts and mitigation for agricultural land use are discussed in section 4.8.

Prior to construction, Mountain Valley would conduct surveys to identify and flag existing irrigation systems and drainage tiles. The pipeline would typically be installed below drain titles. During restoration, any irrigation systems or drain tiles damaged during construction would be repaired or replaced.

The pipelines would be buried deep enough to allow for 48 inches of cover in actively cultivated lands. A minimum of 12 inches of topsoil would be segregated from the full right-of-way in agricultural lands, in accordance with the FERC Plan. Where topsoil is less than 12 inches deep, the actual depth of the topsoil layer would be removed and segregated. If topsoil fill is necessary, it would be locally sourced to prevent invasive species. Other mitigation measures in agricultural lands would include relief from compaction and removal of rocks from topsoil.

2.4.2.7 Rugged Topography

The Project would cross about 1.8 miles of slopes greater than 30 percent. Mountain Valley has developed construction methods for rugged terrain, which include slopes that typically exceed 30 to 35 percent, to allow for the safe operation of equipment, and prevention of severe erosion.

In areas of steep slopes and any side slopes construction, Mountain Valley would employ temporary sediment barriers, such as reinforced silt fences and silt rock, to divert water to vegetated areas. Mountain Valley may install temporary slope breakers during grading activities per the FERC Plan and the Project-specific E&SC Plan. Additionally, Mountain Valley would install post-construction stormwater controls and permanent slope breakers as needed. Mountain Valley has proposed to implement mitigation and stabilization control measures such as trench breaker daylight drains, cutoff drains, transverse trench drains, rock lined swales, riprap natural drains, riprap slope breakers, trench breaker pass-through drains, brow ditches, geogrid reinforcement, and highwall revetment, steep slope revetment and compact slope breakers.

In areas where the pipeline route crosses laterally along a slope, cut and fill grading, or “two-tone” construction techniques, may be used to create a relatively flat working surface. This would require expanded ATWS. Spoil piles, separated every 50 feet by temporary water bars, may be compacted by bulldozers, then covered by mulch.

2.4.2.8 Karst Terrain

The Project would cross minimal areas of karst geology within 0.25-mile of the Project route. Mountain Valley’s karst specialist assessed areas of karst features along the proposed Project route and determined that no impacts on karst formations are anticipated during construction and operation of the Project. In the event that areas of karst are identified during construction, Mountain Valley would implement the measures outlined in section 4.1.4.5; coordinate with the appropriate state agencies; and conduct monitoring during and post-construction for any subsidence or karst impacts.

2.4.2.9 Winter Construction

Mountain Valley developed a *Winter Construction Plan*[7] to address specialized methods and procedures to protect resources during the winter season. The key elements of this plan include:

- use of special snow plowing equipment within the Project workspaces to prevent mixing of snow and underlying soil;
- clearing of snow from roads without blocking driveways or other access points;
- use of safety fencing around open trenches in areas used for snowmobiling, hiking, and similar activities;
- suspension of backfill and topsoil replacement if unfeasible due to frozen conditions;
- use of mulch and ECDs to stabilize topsoil and subsoil piles; and
- delaying final cleanup activities until soils have thawed.

2.4.3 Aboveground Facility Construction

Construction activities at the proposed compressor station, meter stations, and interconnects would include access road construction; site clearing; grading; putting in foundations; erecting buildings; installing equipment such as compressors and metering facilities; restoration and laying gravel in the yards; and erecting security fencing. Initial work at the aboveground facilities would focus on excavations for reinforced concrete foundations. Subsurface friction piles may be required to support foundations. Forms would be set, rebar installed, and concrete poured and cured according to industry stations. Concrete batches would be tested. Backfill would be compacted.

Equipment and piping would be transported to the sites by truck and off-loaded by cranes and/or front-end loaders. The equipment and piping would then be placed on the foundations, leveled, and secured. Piping would be welded, and welds inspected using radiography, ultrasound, or other non-destructive examination methods. Aboveground piping would be painted. Piping would be hydrostatically tested prior to being put into service. Safety equipment and controls, including emergency shutdown, relief valves, gas and fire detection, and engine overspeed and vibration protection would be calibrated and tested. Pig launchers and receivers and MLVs would be installed.

2.5 CONSTRUCTION SCHEDULE AND WORKFORCE

Mountain Valley proposes to begin construction of the Project in the first quarter of 2020 and estimates that it would take up to 32 months to construct, restore, and complete revegetation of its entire Project. Construction of the H-605/H-650 pipeline would be completed using two

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[7] Mountain Valley's *Winter Construction Plan* was included as appendix 1-J to Resource Report 1 in its November 06, 2018, application. The *Winter Construction Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

construction spreads (see table 2.5-1), with in-service proposed in December 2020. The peak construction workforce would be 900 people for the pipeline and aboveground facilities.

TABLE 2.5-1

Construction Spreads for the Southgate Project

Spread Number/Component	Start MP	End MP	Spread Length (miles)	Peak Workforce
Spread 1 - H-605/H-650 pipelines	0	30.4	30.8 a/	325
Spread 2 - H-650 pipeline	30.4	73.1	42.6	325
Lambert Compressor Station	0	0	N/A	110

a/ Includes 0.4 mile of H-605 and 30.4 miles of H-605 pipelines.

Construction crews would typically work 10 hours per day, 6 days per week. Work would be conducted during daytime hours (on average, 7:00 a.m. to 7:00 p.m.), except where the pipe would be installed using the HDD and bore methods, which require around-the-clock operations and typically last a few days to a few weeks.

2.6 ENVIRONMENTAL COMPLIANCE AND MONITORING

2.6.1 Construction Monitoring and Quality Control

During construction, Mountain Valley would provide contractors with all Project design documents, including environmental alignment sheets, and copies of all applicable federal, state, and local permits. Construction would be supervised by a Chief Inspector (CI). Mountain Valley indicates that up to four EIs would be hired per spread who would report to the CI, and whose duties would be consistent with Section II.B of the FERC Plan, including:

- the EI would be a full-time position, separate from other activity inspectors;
- the EI would be responsible for ensuring that the company complies with its construction and environmental mitigation plans, complies with all environmental conditions of the Commission Order, and complies with the environmental conditions of other relevant federal and state permits;
- the EI would have immediate "stop-work" authority for all activities, and would be empowered to take corrective actions to remedy instances of non-compliance; and
- the EI would conduct environmental training for company employees, maintain records, and write reports.

Mountain Valley has agreed to fund a FERC third-party compliance monitoring program during the Project construction phase. Under this program, a contractor is selected by, managed by, and reports solely to the FERC staff to provide environmental compliance monitoring services. The FERC Compliance Monitor would provide daily reports to the FERC Project Manager on compliance issues and make recommendations 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 all phases of construction and throughout restoration, as necessary.

2.7 OPERATION AND MAINTENANCE

Mountain Valley would maintain and operate the pipelines and aboveground facilities in accordance with the DOT/Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations at 49 CFR 192, the FERC regulations at 18 CFR 380.15, and the maintenance provisions found in the FERC Plan, Mountain Valley's Procedures, and the Project-specific E&SC Plan. As required by 49 CFR 192.615, Mountain Valley would establish an Emergency Plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Pipeline safety measures are outlined in section 4.12 of this EIS.

2.7.1 Pipelines

Mountain Valley would maintain a 50-foot-wide permanent operational easement for the H-605 and H-650 pipelines. In accordance with the FERC Plan, vegetation removal within upland portions of the operational easement would not be done more frequently than every 3 years. In wetland areas, the full width of the permanent right-of-way would not be subject to periodic vegetation maintenance; however, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. To facilitate periodic corrosion and leak surveys in both upland and wetland portions of the permanent right-of-way, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained as frequent as necessary to maintain an herbaceous state. In no case would routine vegetation maintenance occur between April 15 and August 1 of any year. No vegetation maintenance activities would be conducted in riparian areas between HDD entry and exit points. Vegetation management is discussed further in section 4.4.

Besides vegetation maintenance, other operational activities on the pipeline right-of-way would include inspections and repairs. Periodic aerial and ground inspections may identify pipeline leaks, erosion or loss of vegetation cover on the right-of-way, and unauthorized encroachment. The cathodic protection system would also be inspected periodically to ensure that it is functioning properly. In addition, pigs are regularly sent through the pipeline to check for corrosion and irregularities in the pipe in accordance with DOT requirements.

2.7.2 Aboveground Facilities

Mountain Valley would perform routine inspections of and maintain all equipment at aboveground facilities, including the Lambert Compressor Station, meter stations, interconnects, MLVs, and pig launchers and receivers. Routine maintenance checks would include calibration of equipment and instrumentation. Safety equipment, such as pressure relief devices and fire and gas detection systems, would be tested for proper operation. Corrective actions would be taken if problems are noted.

The aboveground facilities would be unmanned, with start/stop capabilities controlled from Mountain Valley's Gas Control headquarters. A telemetry system would notify operational personal at local offices and the gas control headquarters of the activation of safety systems or alarms. Maintenance personnel would be dispatched to investigate and take corrective actions.

2.8 FUTURE PLANS AND ABANDONMENT

During public scoping, a comment was submitted regarding the potential for Mountain Valley to further expand the Project and eventually export natural gas. Mountain Valley stated that it has no plans at this time to either expand or abandon the proposed facilities, nor is the Project able or designed to export natural gas. If Mountain Valley proposes any expansion or abandonment of the Project facilities, it would have to seek specific authorization for that action from the FERC. An appropriate environmental review would be conducted, and the public would have the opportunity to comment on Mountain Valley's proposal. Likewise, any proposed abandonment of any facilities approved in these dockets would require additional environmental and regulatory review under section 7(b) of the NGA.

3.0 ALTERNATIVES

3.1 INTRODUCTION

As required by NEPA and Commission policy, we identified and evaluated reasonable alternatives to the Project to determine whether the implementation of an alternative would be environmentally preferable to the proposed action. A reasonable alternative would meet the Project's purpose and would be technically and economically feasible and practical. We evaluated the No Action Alternative, system alternatives, pipeline route alternatives, route variations, and compressor engine type alternatives. An alternative would be environmental preferable if it offers a significant environmental advantage over the proposed action.

To ensure a consistent environmental comparison and to normalize the comparison factors, we generally use desktop sources of information (e.g., publicly available data, geographic information system data, aerial imagery). Where appropriate, we also use site-specific information (e.g., field surveys or detailed designs). Our environmental evaluation considers quantitative data (e.g., acreage or mileage) and uses common comparative factors such as total length, amount of collocation, and land requirements. In recognition of the competing interests and the different nature of impacts 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 and discount or eliminate factors that are not relevant or may have less weight or significance.

We generally consider an alternative to be preferable to a proposed action using three evaluation criteria, as discussed in greater detail below. These criteria include:

1. the alternative meets the stated purpose of the project;
2. is technically and economically feasible and practical; and
3. offers a significant environmental advantage over a proposed action.

The alternatives were reviewed against the evaluation criteria in the sequence presented above. The first consideration for including an alternative in our analysis is whether or not it could satisfy the stated purpose of the Project. An alternative that cannot achieve the purpose for the Project cannot be considered as an acceptable replacement for the Project.

Many alternatives are technically and economically feasible but not practical. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. 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 a project economically impractical.

Alternatives that would not meet the Project's purpose or were not technically/economically feasible or practical were not brought forward to the next level of review.

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, 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.

With regard to the first criterion, Mountain Valley's stated objective for the Project is documented in section 1.1 Purpose and Need. Our analysis of alternatives is based on Project-specific information provided by Mountain Valley, affected landowners, and other concerned parties; comments received during project scoping; publically available information; our consultations with federal and state agencies; and our own research regarding the siting, construction, and operation of natural gas transmission facilities and their impacts on the environment. Unless otherwise noted, we used the same desktop sources of information to standardize comparisons between the Project and each alternative that we evaluated. As a result, some of the information presented in this section relative to the Project may differ from information presented in section 4.0, which is based on data derived from field surveys and engineered drawings.

3.1.1 Public Comments

We received 43 comments requesting that we evaluate alternatives for the Project. In response to these comments, we requested that Mountain Valley provide additional environmental information to enable us to compare alternatives to the proposed action. In some cases, in response to stakeholder, agency, and FERC staff comments, and their own assessments, Mountain Valley revised their proposal and incorporated approximately 101 route variations since the scoping process began in Spring of 2018.

Some commenters recommended that we evaluate the potential for energy efficiency, energy conservation programs, and renewable energy (e.g., wind, solar) to eliminate or meet the need for the Southgate Project. We recognize that energy conservation and efficiency programs help to reduce energy demand and that renewable energy is playing an increasing role in meeting the region's energy needs. However, because the purpose of the Project 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 the Project and are not considered further in this analysis.

3.2 NO ACTION ALTERNATIVE

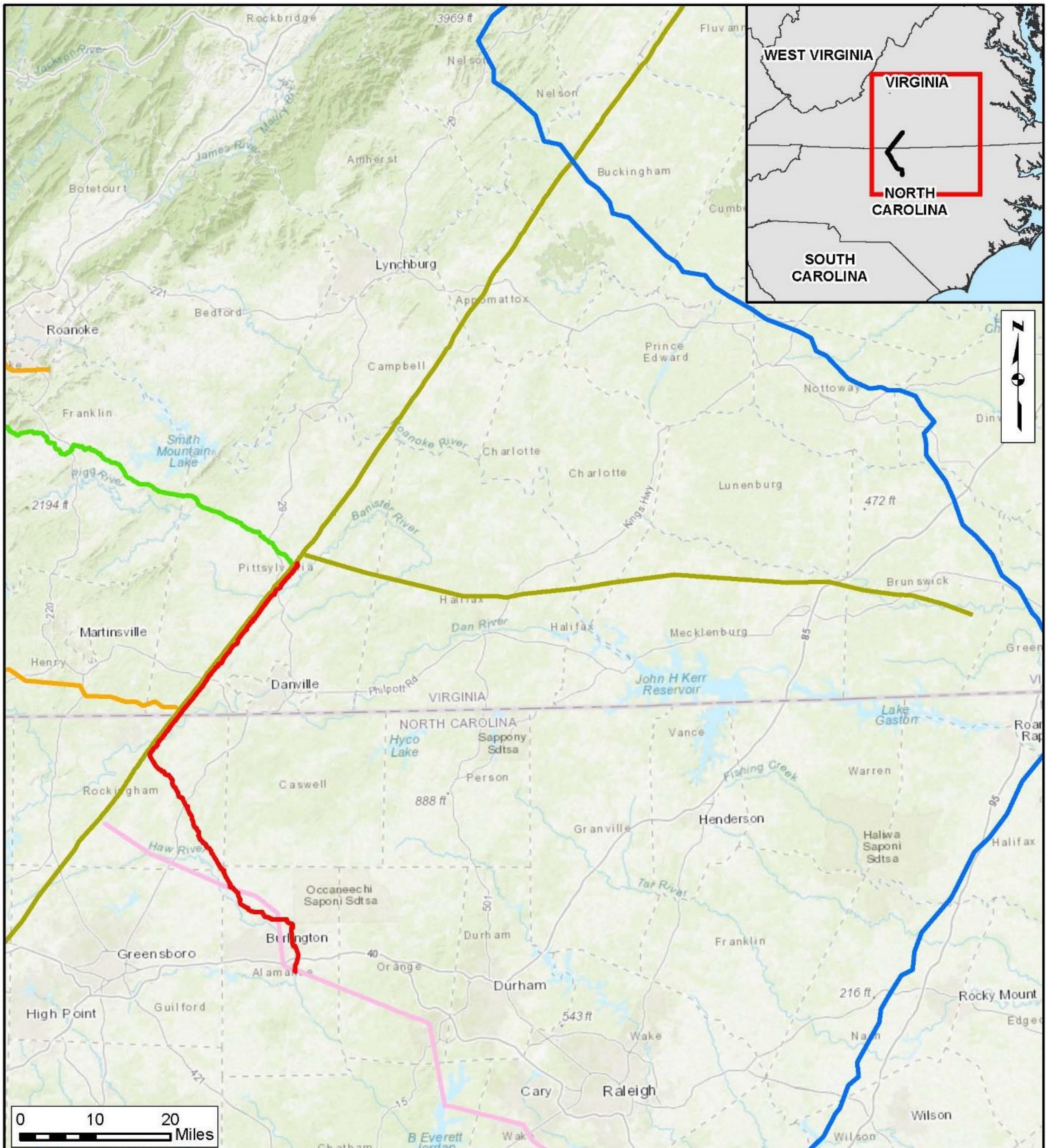
The Commission has two courses of action in processing applications under Section 7 of the NGA: 1) deny the requested action (the No Action Alternative); or 2) grant the Certificate with or without conditions. If the No Action Alternative is selected by the Commission, the Project would not be constructed, and the short- and long-term environmental impacts of the Project would not occur. Additionally, if the No Action Alternative is selected, the stated objectives of the Project would not be met. If the Project is not constructed, shippers may seek other means to obtain an equivalent supply of natural gas from new or existing pipeline systems. Because any replacement project capable of transporting similar volumes of natural gas may result in the expansion of existing natural gas transportation systems or the construction of new infrastructure; both of which are likely to result in impacts comparable to those described in section 4.0 of this draft EIS, we conclude that in addition to not meeting the Project objective, the No Action Alternative is also not likely to provide a significant environmental advantage. Therefore, we dismiss it from further consideration.

3.3 SYSTEM ALTERNATIVES

System alternatives to the proposed action would make use of existing or other proposed natural gas transmission systems/facilities to meet the stated purpose of the Project. Implementing a system alternative would make it unnecessary to construct all or part of the Project, although some modifications or additions to an existing transmission system/facility or other proposed transmission system/facility may be necessary. Existing pipeline systems and systems under construction are depicted on figure 3.3-1.

3.3.1 Existing and Approved Natural Gas Pipeline Systems

There are currently two existing FERC-jurisdictional natural gas pipeline transportation systems operating near the Project area: Transcontinental Gas Pipe Line Company LLC (Transco) and East Tennessee. There is also one approved FERC-jurisdictional natural gas pipeline system, the Atlantic Coast Pipeline (ACP) Project, which is currently under construction about 100 miles west of the Project. Additionally, one intrastate pipeline system owned by Cardinal Pipeline Company is operating near the Project. These pipelines currently do not have the available individual capacity, combined available capacity, nor direct physical connection to transport the required volumes of natural gas to the delivery point proposed for the Project. Without modifications, as described in the following section, there would not be sufficient capacity on any of the existing pipeline systems to transport 375 MMcf/d of natural gas. Therefore, we do not consider use of existing pipeline systems, as a technically feasible alternative to the Project.



Proposed Pipeline Route
Atlantic Coast Pipeline (under construction)
Cardinal Pipeline
East Tennessee Pipeline
Transco Pipeline
Mountain Valley Pipeline (under construction)

Figure 3.3-1

Southgate Project

Existing and Approved Pipeline Systems

3.3.2 Modifications of Existing and Approved Natural Gas Pipeline Systems

Since none of the existing pipeline systems in the Project area have the capacity to meet the Project's purpose in their current state, each system would require modifications to meet the purpose of the Project. The modifications could include additional pipeline construction to connect to the natural gas supply, delivery area, or both; additional compression; or some combination of these options.

3.3.2.1 Transco Pipeline System Alternative

The existing Transco system consists of various diameter pipelines extending approximately 10,200 miles between Texas and New York. The system has a peak design capacity of almost 15 Bcf/d of natural gas to markets in the Northeast, Mid-Atlantic, and Southeast regions of the United States. The Project would be located adjacent to Transco Pipeline System in Virginia and North Carolina from mileposts (MPs) 0.4 and 32.9. The Transco system does not connect with the Project's proposed receipt point with the Mountain Valley Pipeline. To meet the purpose of the Project using the Transco pipeline system, major system modifications similar to the proposed Project would be necessary. Modifications would include approximately 40 miles of new pipeline from the Transco pipeline system to the T-21 Haw River Interconnect, mainline pipeline upgrades to the Transco pipeline system, and additional compression. These modifications would result in environmental impacts similar to those that would occur as proposed by the Project. Therefore, we conclude that this alternative would not provide a significant environmental advantage.

3.3.2.2 East Tennessee System Alternative

The East Tennessee pipeline system has the capacity to transport 1.9 billion cubic feet per day (bcf/d) of natural gas and extends from Nashville, Tennessee, through Virginia, to Eden, North Carolina where it interconnects with the Transco pipeline system. The East Tennessee pipeline system does not connect with the Project's proposed receipt point with the Mountain Valley Pipeline. The Project would interconnect with the East Tennessee pipeline system at the LN 3600 Interconnect taking gas to delivery points. To meet the purpose of the Project, modifications to the East Tennessee pipeline system would be required to supply 375 MMcf/d of natural gas to the Dominion Energy distribution system. The modifications would include upgrades similar to the Project including approximately 30 miles of pipeline collocated with the Transco pipeline system, 40 miles of new pipeline, and additional compression. These modifications would result in environmental impacts similar to those that would occur as proposed by the Project. Therefore, we conclude that this alternative would not provide a significant environmental advantage.

3.3.2.3 Atlantic Coast Pipeline Project

The ACP Project, currently under construction with an in-service date of mid-2020, consists of 604 miles of natural gas pipeline in West Virginia, Virginia, and North Carolina. The ACP Project is approximately 100 miles east of the T-15 Dan River and T-21 Haw River interconnects. A minimum of 100 miles of new pipeline and compression infrastructure would be required to modify the ACP Project to serve as an alternative to the Project. Therefore, we conclude that the ACP Project would not provide a significant environmental advantage to the Project, and it was not studied further.

3.3.2.4 Cardinal Pipeline System

The Cardinal Pipeline Company, co-owned by affiliates of Transco, Piedmont Natural Gas Company, and Dominion Energy, operates 105 miles of 24-inch-diameter intrastate pipeline in North Carolina originating in Rockingham County at an interconnect with the Transco pipeline system, extending southwest to Wake County. The Cardinal Pipeline Company transports natural gas from the Transco pipeline system to the Dominion Energy distribution system and Piedmont Natural Gas system. To meet the objective of the Project, modifications to the existing Cardinal Pipeline and Transco pipeline system including 43 miles of loop pipeline along the Transco pipeline system, 35 miles of loop pipeline along the Cardinal Pipeline, 2 miles of greenfield pipeline, and additional compression would be required. These modifications would result in environmental impacts similar or greater to those that would occur as proposed by the Project. Therefore, we conclude that this alternative would not provide a significant environmental advantage.

3.4 ROUTE ALTERNATIVES AND VARIATIONS

Early in the development of the Project, Mountain Valley considered a pipeline route that was largely collocated with existing utility rights-of-way. Upon more detailed route evaluation and after the determination of the presence of constraints such as residential areas, ponds, and side slopes, Mountain Valley subsequently incorporated minor deviations in the Project route. During the course of the pre-filing and environmental scoping process, Mountain Valley incorporated at least 46 of the 101 route variations into the Southgate route to avoid and/or minimize impacts on specific resources at the request of landowners and stakeholders.

Major route alternatives represent substantial deviations from a proposed route that may offer significant environmental advantages compared to the proposed route. Smaller route alternatives represent deviations to the proposed route between certain mileposts in a particularly sensitive area that may offer a significant environmental advantage to the proposed route. Minor route variations include minor deviations (or reroutes) over a short distance that might avoid a specific resource at that location.

We evaluated three major route alternatives including the Berry Hill Alternative, Lake Cammack East Alternative, and the North-South Alternative. The locations of the major route alternatives are shown on figure 3.4-1. We also evaluated five minor route alternatives including the Haw River Alternative, Haw River West Alternative, Green Level Alternative, Jimmie Kerr Road Alternative, and the Duke Energy Powerline `Extension Alternative. The locations of the minor route alternatives are shown on figures 3.4-2 through 3.4-6. Finally, we evaluated twelve minor route variations including the Nicholson Variation, Whitehead Variation, Robert Pollok-Hill View Farms Variation, Moore Variation, Strader Variation, Madrin Variation, Bombardier Variation, Shambley Variation 1, Shambley Variation 2, Martin Marietta Variation, and Town of Haw River Variation. The locations of the minor route variations are shown on figures 3.4-7 through 3.4-16.

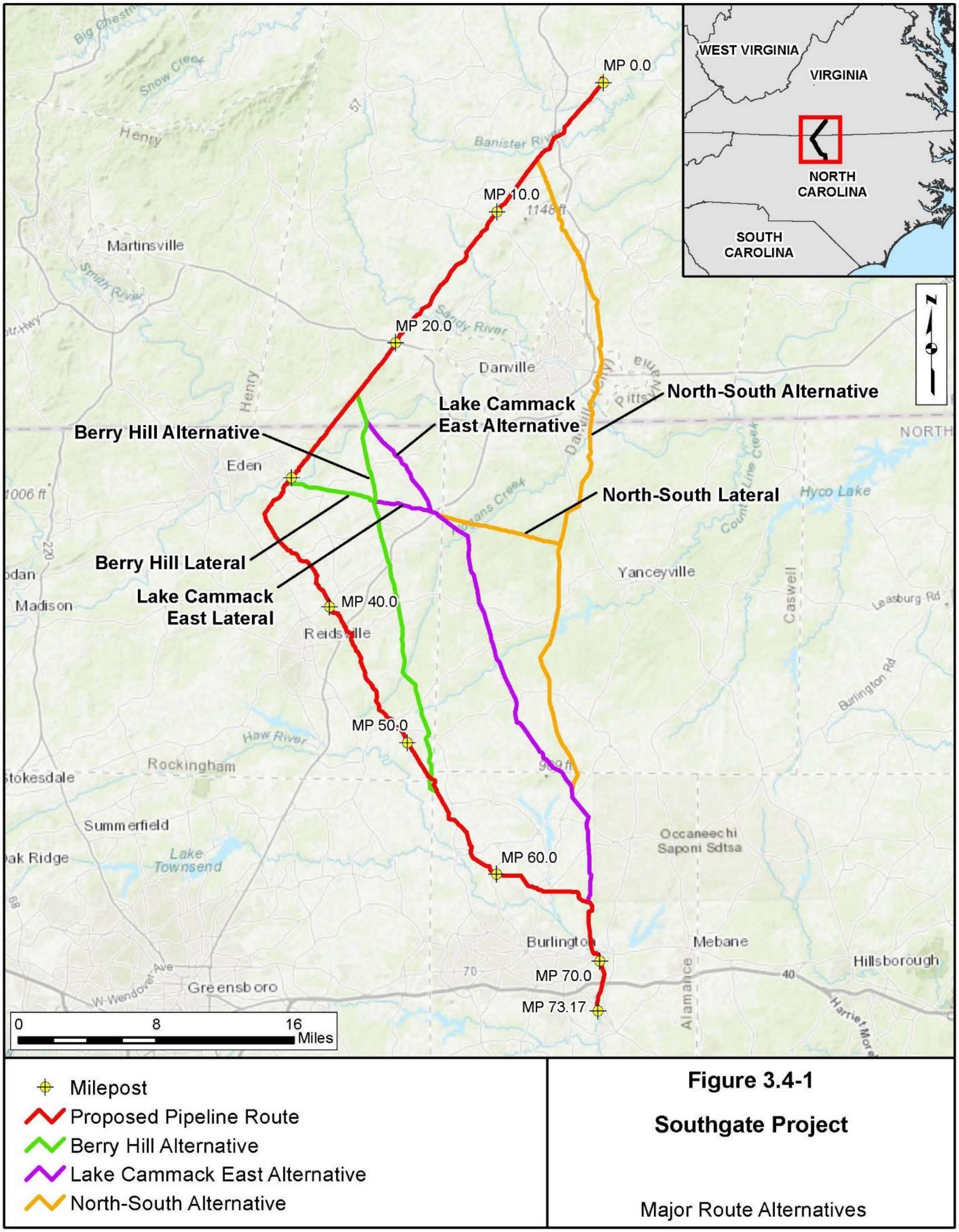


Figure 3.4-1

Southgate Project

Major Route Alternatives

3.4.1 Major Route Alternatives

3.4.1.1 Berry Hill Alternative

Based on stakeholder suggestions to route away from the Eden and Reidsville areas, we evaluated the Berry Hill Alternative. This alternative deviates from the proposed route at MP 23.7 in Pittsylvania County near Berry Hill, Virginia extending southeast 30.1 miles to rejoin the proposed route at MP 53.6 in Alamance County, North Carolina. The alternative includes a 5.4-mile lateral from the T-15 Dan River Interconnect with Dominion Energy, east of Eden, North Carolina to the alternative south of Guerrant Springs Road. Table 3.4-1 provides a comparison between the proposed route and the Berry Hill Alternative, and the location of the alternative is shown on figure 3.4-1.

The Berry Hill Alternative would cross two fewer perennial waterbodies, 0.8 acre less total wetland including 0.5 acre of forested wetland during construction, one less environmental justice area, one less potentially eligible historic property, and one less residence within 25 feet of workspace in comparison to the proposed route. However, the Berry Hill Alternative would be 0.2 mile longer; require a 5.4-mile lateral; and affect seven more residences within 50 feet of workspace. Within the range of the alternative route the proposed route would be collocated with existing rights-of-way for 14.5 miles, or about 48 percent of the total length compared to 4.6 miles or 15 percent of the total length of the Berry Hill Alternative. The Berry Hill Alternative would result in 365.0 acres of impacts during construction compared to the 363.1 acres of the proposed route. The Berry Hill Alternative would also impact about 25 more acres of forested land than would the proposed route. While the Berry Hill Alternative does offer some advantages, we conclude that the environmental advantages, when considered on the whole, are not significant.

TABLE 3.4-1

Comparison of the Berry Hill Alternative and the Southgate Proposed Route

Feature	Berry Hill Alternative	Proposed Route
Total length (miles) a/	30.1	29.9
Length adjacent to existing right-of-way (miles)	4.6	14.5
Land affected during construction (acres) a/	365	363.1
NRHP designated or eligible historic districts crossed (miles)	0	0
Unlisted/potential eligible historic properties (number)	0	1
Landowner parcels crossed (number)	154	149
Residences within 25 and 50 feet of the edge of the construction right-of-way (number)	0 /11	1 / 4
Environmental Justice Areas (number) b/	11	12
Agricultural Land crossed (miles) c/	9.5	10.5
Forested Land affected during construction (acres)	178.3	177.5
Wetlands affected by construction (acres) d/	1.4	2.2
Forested wetlands affected by construction (acres) d/	0.8	1.3
Perennial waterbody crossings (number)	14	16

TABLE 3.4-1

Comparison of the Berry Hill Alternative and the Southgate Proposed Route

Feature	Berry Hill Alternative	Proposed Route
Presence of critical habitat or federally endangered or threatened species (Yes/No). Number of species.	No/0	No/0
Shallow bedrock crossed (miles)	3.8	4.0

a/ Assuming 100-foot-wide construction right-of-way. Includes a 5.4-mile long lateral to T-15 Dan River Interconnect.
b/ U.S. Census Bureau 2017b, 2017c.
c/ Includes pasture/hay and cultivated crops.
d/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

3.4.1.2 Lake Cammack East Alternative

This alternative also deviates from the proposed route at MP 23.7 in Pittsylvania County near Berry Hill, extending southeast 43.3 miles on the east side of Lake Cammack and rejoins the proposed route at MP 66.1 in Alamance County, North Carolina. The Lake Cammack East Alternative was considered based on stakeholder suggestions to route away from Eden and Reidsville. This alternative includes an 8.8-mile-long lateral from the T-15 Dan River Interconnect with Dominion Energy, east of Eden to the alternative north of U.S. Route 29. Table 3.4-2 provides a comparison between the proposed route and the Lake Cammack East Alternative, and the locations of the alternative is shown on figure 3.4-1.

The Lake Cammack East Alternative would cross 29 fewer parcels, one less potentially eligible historic property, and two less Environmental Justice Areas in comparison to the proposed route. However, the alternative would be 0.8 mile longer; require an 8.8 mile lateral; affect one more residences within 25 feet and five more residences within 50 feet of workspace; and impact an additional 2.5 acres of total wetlands, 3.5 acres of forested wetlands, and 32.6 acres of forested land during construction. Within the range of the alternative route, the proposed route would be collocated with existing rights-of-way for 19.8 miles, or about 47 percent of the total length compared to 14.6 miles or 34 percent of the total length of the alternative. The Lake Cammack East Alternative would result in 525.8 acres of impacts during construction compared to the 515.3 acres for the proposed route. Given the consideration of these factors, we conclude that the Lake Cammack East Alternative does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-2

Comparison of the Lake Cammack East Alternative and the Southgate Proposed Route

Feature	Lake Cammack East Alternative	Proposed Route
Total length (miles) a/	43.3	42.5
Length adjacent to existing right-of-way (miles)	14.6	19.8
Land affected during construction (acres) a/	525.8	515.3
NRHP designated or eligible historic districts crossed (miles)	0	0
Unlisted/Potential Eligible Historic Properties (number)	0	1
Landowner parcels crossed (number)	191	220
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	2 /11	1 / 6
Environmental Justice Areas (Number) b/	16	14
Agricultural Land crossed (miles) c/	13.8	16.7
Forested Land affected during construction (acres)	274.6	242
Wetlands affected by construction (acres) d/	5.4	2.9
Forested Wetlands affected by construction (acres) d/	4.9	1.4
Perennial waterbody crossings (number)	19	18
Presence of critical habitat or federally endangered or threatened species (Yes/No). Number of species.	No / 0	No / 0
Shallow bedrock crossed (miles)	4.3	4.0

a/ Assuming 100-foot-wide construction right-of-way. Includes an 8.8-mile long lateral to T-15 Dan River Interconnect.

b/ U.S. Census Bureau 2017b, 2017c.

c/ Includes pasture/hay and cultivated crops.

d/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

3.4.1.3 North-South Alternative

The North-South Alternative deviates from the proposed route at MP 6.1 in Pittsylvania County, extending south 63.4 miles to rejoin the proposed route at MP 66.1 in Alamance County. The alternative was developed from suggestions from stakeholders to develop a straight line alternative routed east of Danville, Virginia. This alternative includes a 16.6-mile-long lateral from the T-15 Dan River Interconnect with Dominion Energy, east of Eden, to the alternative route approximately 2.3 miles south of Foster Road. Table 3.4-3 provides a comparison between the proposed route and the North-South Alternative, and the location of the alternative is shown on figure 3.4-1.

The North-South Alternative would cross 9.8 miles less agricultural land and affect two less residences within 25 feet and two less potentially eligible historic properties in comparison to the proposed route. However, the alternative would be 3.2 miles longer; require a 16.6 mile lateral, cross 61 more parcels, affect 11 more residences within 50 feet of workspace; crosses three more streams; and impact 2.3 acres more acres of wetlands (1.4 more acres of forested wetlands), and 144.2 more acres of forested land during construction. Within the range of the alternative route, the proposed route would be collocated with existing rights-of-way for 26.7 miles, or about 44 percent of the total length compared to 25.4 miles or 40 percent of the total length of the alternative. The North-South Alternative would result in 769.1 acres of impacts during construction compared to the 729.6 acres of the proposed route. Given the consideration of these factors, we conclude that the North-South Alternative does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-3

Comparison of North-South Alternative and the Southgate Proposed Route

Feature	North-South Alternative	Proposed Route
Total length (miles) a/	63.4	60.2
Length adjacent to existing right-of-way (miles)	25.4	26.7
Land affected during construction (acres) a/	769.1	729.6
NRHP designated or eligible historic districts crossed (miles)	0	0
Unlisted/Potential Eligible Historic Properties (number)	0	2
Landowner parcels crossed (number)	369	308
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	2 / 23	4 / 12
Environmental Justice Areas (number) b/	25	22
Agricultural Land crossed (miles) c/	15.2	25
Forested Land affected during construction (acres)	464.6	320.4
Wetlands affected by construction (acres) d/	5.5	3.2
Forested Wetlands affected by construction (acres) d/	2.8	1.4
Perennial waterbody crossings (number)	31	28
Presence of critical habitat or federally endangered or threatened species (Yes/No). Number of species.	No / 0	No / 0
Shallow bedrock crossed (miles)	10.4	4.8

a/ Assuming 100-foot-wide construction rights-of-way and 50-foot-wide permanent rights-of-way. Includes a 16.6-mile long lateral to T-15 Dan River Interconnect.
b/ U.S. Census Bureau 2017b, 2017c.
c/ Includes pasture/hay and cultivated crops.
d/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction rights-of-way and 50-foot-wide permanent rights-of-way.

3.4.1.4 Major Route Alternatives Conclusion

While we did identify major route alternatives that would meet the Project objective and were technically (and probably economically) feasible, we did not identify a major route alternative that would provide a significant environmental advantage, when compared with the corresponding portions of the proposed route.

3.4.2 Minor Route Alternatives

We evaluated five minor route alternatives for the Project pipeline route in response to several public comments received to increase collocation with existing rights-of-way in order to minimize impacts on residences and other areas of public concern. Collocation alternatives developed include the Haw River Alternative, the Haw River West Alternative, the Green Level Alternative, and the Duke Energy Powerline Alternative. The Jimmie Kerr Road Alternative was developed in response to public concerns about the area the proposed route traverses from MP 72.0 to 73.0. For minor route alternatives, our comparison of resources affected includes only the area (MP range) where the deviation occurs. A brief analysis of these alternatives is presented below.

3.4.2.1 Haw River Alternative

We considered the Haw River Alternative in response to stakeholder concerns to utilize existing rights-of-way to avoid or minimize impacts on residences between the Stony Creek Reservoir in Burlington, North Carolina and the Project terminus in Graham, North Carolina. This alternative deviates from the proposed route between MP 63.9 and MP 72.9. The alternative extends southeast paralleling the existing Cardinal Pipeline for 2.2 miles crossing and paralleling the Haw River and the existing Cardinal Pipeline for an additional 3.4 miles. The alternative deviates from the Cardinal Pipeline just south of Interstate 40/85, turning east to cross the Haw River and reconnect with the proposed route at MP 72.9. Table 3.4-4 provides a comparison between the proposed route and the Haw River Alternative, and the location of the alternative is shown on figure 3.4-2.

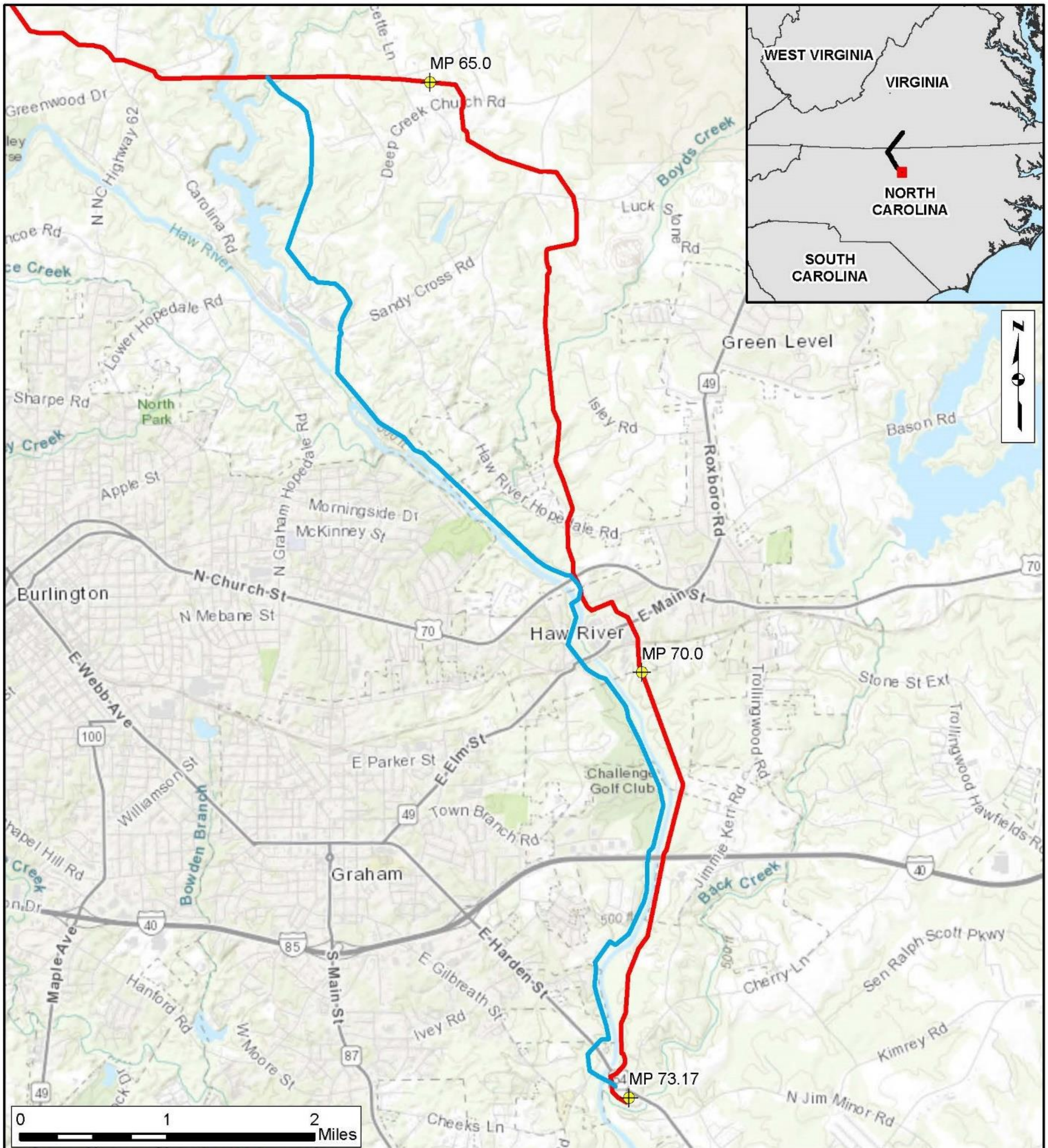
The Haw River Alternative would be collocated for an additional 5.7 miles of rights-of-way; cross 31 fewer parcels, 2.5 fewer acres of forested land, and 9.1 fewer acres of agricultural land; require 7.4 acres less of construction rights-of-way; has four less residences within 25 and 50 feet of the construction rights-of-way; and is 0.6 mile less in length in comparison to the proposed route. However, the alternative would cross two additional Environmental Justice Areas, five more waterbodies and affect an additional 6.6 acres of wetland compared to the proposed route within the range of the alternative. Given the consideration of these factors, we conclude that the Haw River Alternative does offer some advantages and affects less residences, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-4

Comparison of the Haw River Alternative and the Southgate Proposed Route

Feature	Haw River Alternative	Proposed Route
Total length (miles)	8.7	9.3
Construction rights-of-way (acres) a/	105.7	113.1
Total number of parcels crossed	53	84
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	1 / 1	5 / 5
Environmental Justice Areas (number) b/	7	5
Unlisted/Potential Eligible Historic Properties (number)	0	1
Number of waterbodies crossed	23	18
Number of NWI wetlands crossed	9	1
NWI wetlands within construction right-of-way (acres) c/	6.8	0.2
Agricultural Land within construction right-of-way (acres) d/	19.5	28.6
Forested Land affected during construction (acres)	65	67.5
Length adjacent to existing right-of-way (miles)	5.95	0.25

a/ Assuming 100-foot-wide construction right-of-way.
b/ U.S. Census Bureau 2017b, 2017c.
c/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
d/ Includes pasture/hay and cultivated crops.



Milepost
Proposed Pipeline Route
Haw River Alternative

Figure 3.4-2

Southgate Project

Minor Route Alternatives
Haw River Alternative

3.4.2.2 Haw River West Alternative

We evaluated the Haw River West Alternative in response to stakeholder concerns to utilize existing rights-of-way to minimize impacts on residences between Haw River and Graham. This alternative follows the same footprint as the Haw River Alternative between MP 69.1 and MP 72.5 of the proposed route, with a slight variation at the Haw River crossing just south of East Harden Street where it joins the proposed route at MP 73.0. Table 3.4-5 provides a comparison between the proposed route and the Haw River West Alternative, and the location of the alternative is shown on figure 3.4-3.

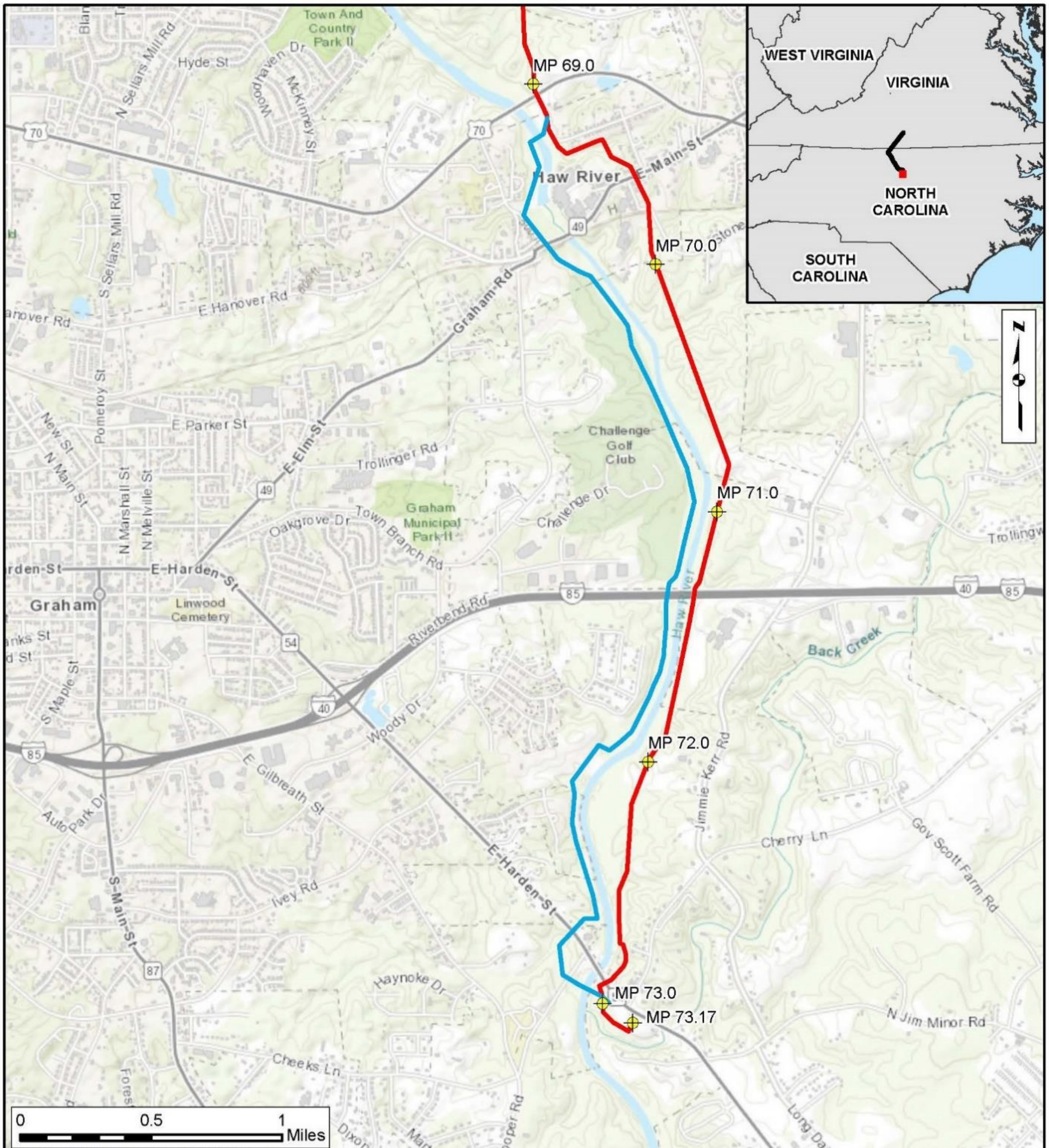
The Haw River West Alternative would be collocated with an existing right-of-way for an additional 3.4 miles, affect 3 less residences within 25 and 50 feet of the construction rights-of-way; cross 13 less parcels; and 5.5 acres less of forested land. However, the alternative would be 0.1 miles longer, require 1.9 acres of construction rights-of-way, include multiple crossings of Haw River; cross an additional three Environmental Justice Areas and four waterbodies; and impact 6.8 more acres of wetland and 0.5 acres of agricultural land compared to the proposed route. Given the consideration of these factors, we conclude that Haw River West Alternative has some advantages and affects less residences, but overall, would result in resource impacts that are similar to the proposed route. Consequently, the alternative does not provide a significant environmental advantage when compared to the proposed route.

TABLE 3.4-5

Comparison of the Haw River West Alternative and the Southgate Proposed Route

Feature	Haw River West Alternative	Proposed Route
Total length (miles)	4.0	3.9
Construction rights-of-way (acres) a/	48.9	47
Total number of parcels crossed	30	43
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0 / 0	5 / 5
Environmental Justice Areas (number) b/	6	3
Unlisted/Potential Eligible Historic Properties (number)	0	1
Number of waterbodies crossed	12	8
Number of NWI wetlands crossed	9	0
NWI wetlands within construction right-of-way (acres) c/	6.9	0.1
Agricultural Land within construction right-of-way (acres) d/	6.9	6.4
Forested Land affected during construction (acres)	26.2	31.7
Length adjacent to existing right-of-way (miles)	3.6	0.2

a/ Assuming 100-foot-wide construction right-of-way.
b/ U.S. Census Bureau 2017b, 2017c.
c/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
d/ Includes pasture/hay and cultivated crops.



Milepost
Proposed Pipeline Route
Haw River West Alternative

Figure 3.4-3

Southgate Project

Minor Route Alternatives
Haw River West Alternative

3.4.2.3 Green Level Alternative

We evaluated the Green Level Alternative in response to stakeholder concerns to utilize existing rights-of-way to minimize impacts on residences in the vicinity of Green Level, North Carolina. This alternative deviates from the proposed route at MP 65.8 and proceeds east and south around the community of Green Level before rejoining the proposed route at MP 70.8. Table 3.4-6 provides a comparison between the proposed route and the Green Level Alternative, and the location of the alternative is shown on figure 3.4-4.

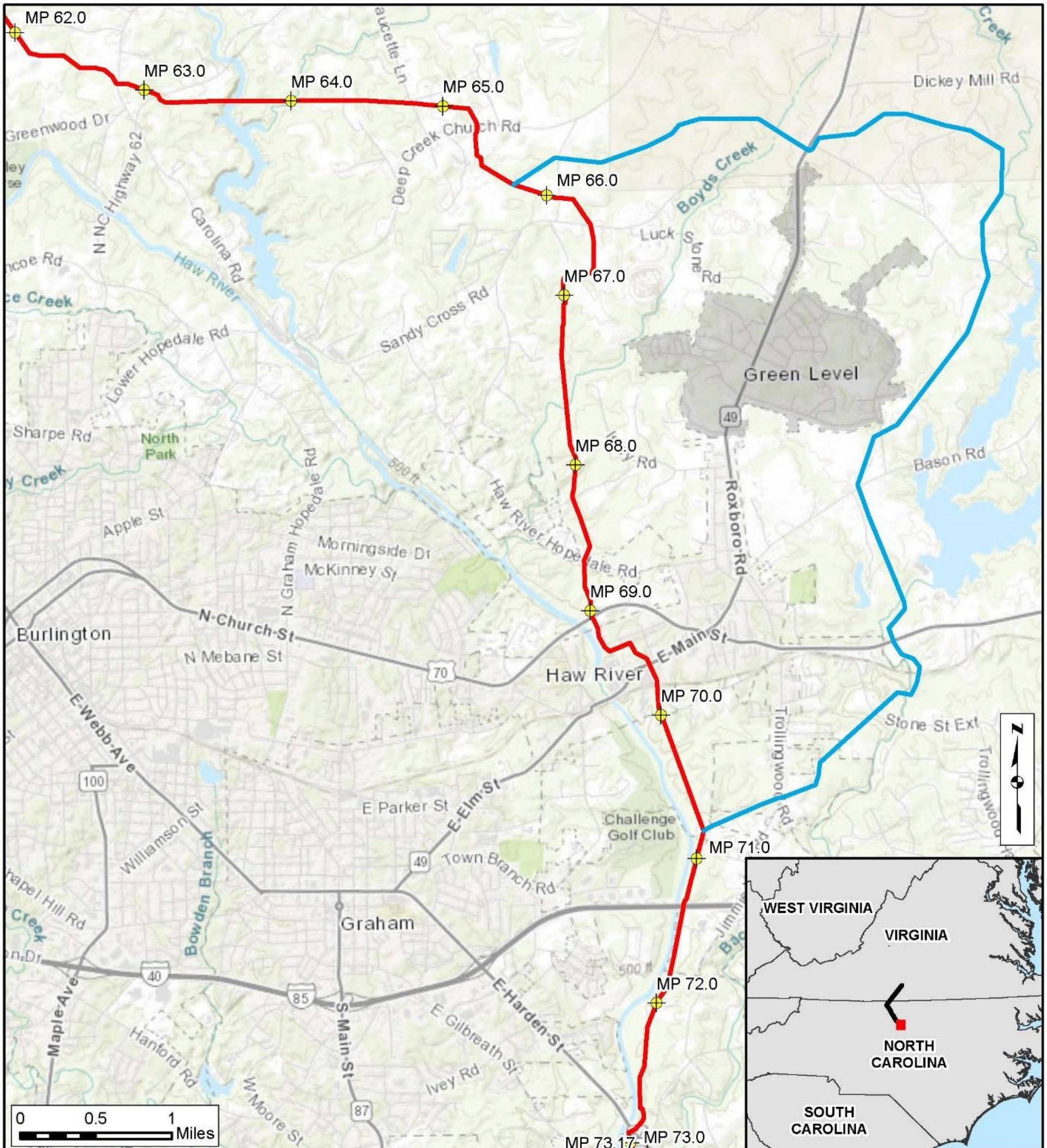
The Green Level Alternative would have three fewer residences within 25 of the workspace; affect one less potentially eligible historic property, and collocate with an additional 1.8 miles of existing rights-of-way in comparison with the proposed route. However, the Green Level alternative would be 4.2 miles longer; require an additional 51.0 acres of construction rights-of-way; cross two more Environmental Justice Areas, and impact an additional 0.5 acre of wetlands, 24.7 acres of agricultural land, and 25.1 acres of forested land compared to the proposed route. Given the consideration of these factors, we conclude that the Green Level Alternative does offer some advantages and affects less residences, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-6

Comparison of the Green Level Alternative and the Southgate Proposed Route

Feature	Green Level Alternative	Proposed Route
Total length (miles)	9.4	5.2
Construction rights-of-way (acres) a/	114.0	63.0
Total number of parcels crossed	56	55
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0 / 0	3 / 3
Environmental Justice Areas (number) b/	6	4
Unlisted/Potential Eligible Historic Properties (number)	0	1
Number of waterbodies crossed	14	12
Number of NWI wetlands crossed	5	1
NWI wetlands within construction right-of-way (acres) c/	0.7	0.2
Agricultural Land within construction right-of-way (acres) d/	36.2	11.5
Forested Land affected during construction (acres)	64.6	39.5
Length adjacent to existing right-of-way (miles)	2.0	0.2

a/ Assuming 100-foot-wide construction right-of-way.
b/ U.S. Census Bureau 2017b, 2017c.
c/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
d/ Includes pasture/hay and cultivated crops.



Milepost
Proposed Pipeline Route
Green Level Alternative

Figure 3.4-4

Southgate Project

Minor Route Alternatives
Green Level Alternative

3.4.2.4 Jimmie Kerr Road Alternative

We evaluated the Jimmie Kerr Road Alternative in response to multiple landowner and stakeholder concerns in the area between MP 72 and 73. The Jimmie Kerr Road Alternative originates at MP 71.8 traveling southeast, west, and southwest before rejoining the proposed route at MP 73.1. Table 3.4-7 provides a comparison between the proposed route and the Jimmie Kerr Road Alternative, and the location of the alternative is shown on figure 3.4-5.

The alternative would have two less residences within 25 feet of the workspace compared to the proposed route, however, the alternative would affect four additional parcels, 8.6 acres of agricultural land, and 1.3 acres of forested land compared to the proposed route. Additionally, the alternative would be 0.8 mile longer than the proposed route and require 9.1 acres of additional construction rights-of-way. Given the consideration of these factors, we conclude that Jimmie Kerr Road Alternative does not provide a significant environmental advantage when compared to the proposed route.

TABLE 3.4-7

Comparison of Jimmie Kerr Road Alternative and the Southgate Proposed Route

Feature	Jimmie Kerr Road Alternative	Proposed Route
Total length (miles)	2.2	1.4
Construction rights-of-way (acres) a/	26.3	17.2
Total number of parcels crossed	19	15
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0 / 0	2 / 2
Environmental Justice Areas (number) b/	3	2
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	3	3
Number of NWI wetlands crossed	0	0
Total NWI wetland crossing length (feet)	0	0
NWI wetlands within construction right-of-way (acres) c/	0	0
Agricultural Land within construction right-of-way (acres) d/	11.5	2.9
Forested Land affected during construction (acres)	11.9	10.6
Length adjacent to existing right-of-way (miles)	0	0.1

a/ Assuming 100-foot-wide construction right-of-way.
b/ U.S. Census Bureau 2017b, 2017c.
c/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
d/ Includes pasture/hay and cultivated crops.

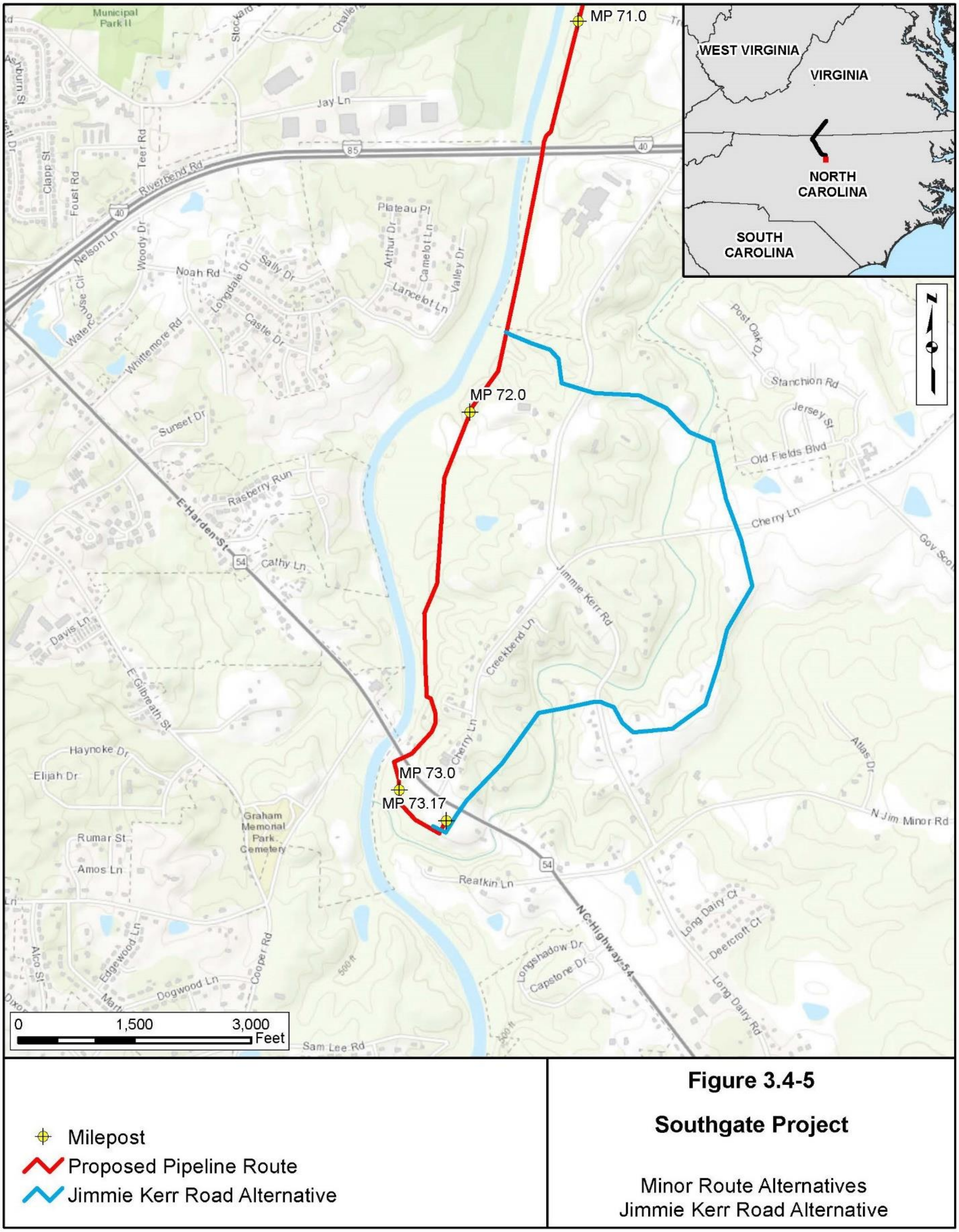


Figure 3.4-5

Southgate Project

Minor Route Alternatives
Jimmie Kerr Road Alternative

3.4.2.5 Duke Energy Powerline Extension Alternative

We evaluated an alternative that would increase collocation with the existing Duke Energy electrical transmission line rights-of-way between MP 58.2 and MP 62.0. The alternative originates at MP 58.2 of the proposed route and extends south, collocated with a Duke Energy electrical transmission line easement, crossing Burch Bridge Isely School Road, and rejoining the proposed route at MP 62.0. Table 3.4-8 provides a comparison between the proposed route and the Duke Energy Powerline Extension Alternative, and the location of the alternative is shown on figure 3.4-6.

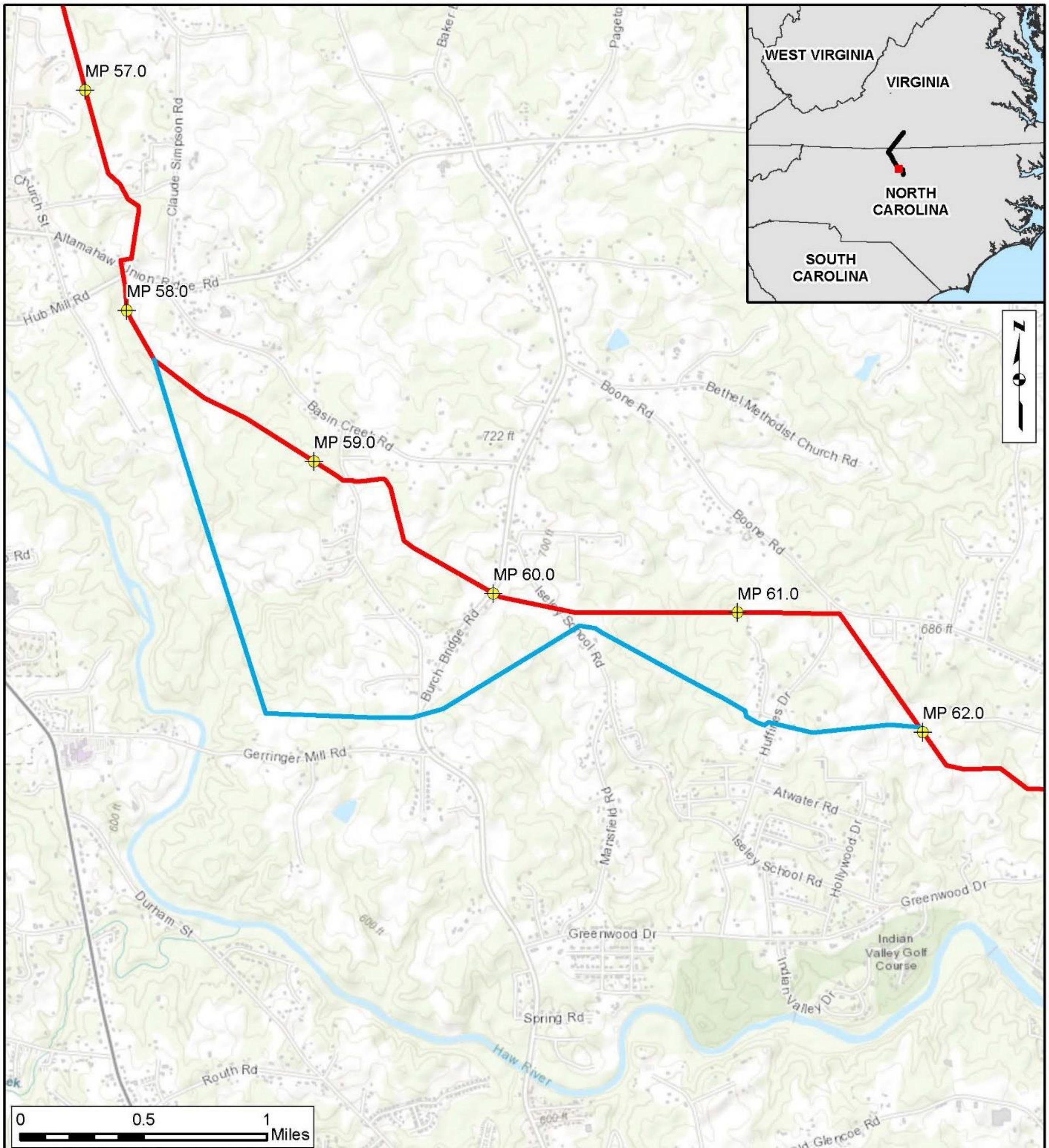
The Duke Energy Powerline Extension Alternative would be collocated for an additional 1.6 miles of rights-of-way, and would impact 3.9 acres less of agricultural land compared to the proposed route. However, the alternative would be slightly longer (0.7 mile); be within 25 feet of one additional residence; cross seven more parcels; and require an additional 7.7 acres of construction rights-of-way. The alternative would impact 3.9 more acres of forested land and cross 5 additional waterbodies compared to the proposed route. Given the consideration of these factors, we conclude that the Duke Energy Powerline Extension Alternative does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-8

Comparison of the Duke Energy Powerline Extension Alternative and the Southgate Proposed Route

Feature	Duke Energy Powerline Extension Alternative	Proposed Route
Total length (miles)	4.4	3.7
Construction rights-of-way (acres) a/	53.3	45.6
Total number of parcels crossed	28	21
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	1 / 1	0 / 0
Environmental Justice Areas (number) b/	3	3
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	10	5
Number of NWI wetlands crossed	2	1
NWI wetlands within construction right-of-way (acres) c/	0.3	0.1
Agricultural Land within construction right-of-way (acres) d/	17.8	21.7
Forested Land affected during construction (acres)	34.3	21.2
Length adjacent to existing right-of-way (miles)	2.5	0.9

a/ Assuming 100-foot-wide construction right-of-way.
b/ U.S. Census Bureau 2017b, 2017c.
c/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
d/ Includes pasture/hay and cultivated crops.



Milepost
Proposed Pipeline Route
Duke Energy Powerline Extension Alternative

Figure 3.4-6

Southgate Project

Minor Route Alternatives
Duke Energy Powerline
Extension Alternative

3.4.2.6 Minor Route Alternatives Conclusion

While we did identify minor route alternatives that would meet the Project objective and were technically (and probably economically) feasible, we did not identify a major route alternative that would provide a significant environmental advantage, when compared with the corresponding portions of the proposed route.

3.4.3 Minor Route Variations

Route variations are shorter than route alternatives, but are generally longer and more substantial than minor route deviations designed to avoid or further reduce impacts on specific localized resources. We have considered eight route variations that Mountain Valley developed during initial Project planning and throughout the pre-filing and environmental scoping processes, generally in response to stakeholder or FERC staff comments. Many of the variations were assessed at the request of landowners who wanted the route to avoid their property due to sensitive features, such as wells, septic systems, and agricultural operations. As stated in section 4.3 of this draft EIS, though landowner surveys by Mountain Valley to identify these features are not complete, they are committed to work with landowners to make micro adjustments to the route and workspaces if necessary to avoid and/or ensure protection of all private water wells, septic systems, and sensitive features located in or near the construction workspace. In addition, Mountain Valley would offer water quality testing of any private well within 150 feet of the Project workspace.

3.4.3.1 Nicholson Variation

We evaluated the Nicholson Variation that Mountain Valley developed to avoid or reduce impacts on the Nicholson property and address comments submitted to the FERC Docket on August 21, 2018.[1] This variation deviates from the proposed route at MP 3.65 extending southeast and south before turning northeast, rejoining the proposed route at MP 4.0. Table 3.4-9 provides a comparison between the proposed route and the Nicholson Variation, and the location of the variation is shown on figure 3.4-7.

This variation would affect 0.1 less acres of forested land in comparison to the proposed route. However, the Nicholson Variation would be 0.3 mile longer; affect an additional 2.1 acres of agricultural land; and require an additional 4.2 acres of construction rights-of-way than the proposed route. Given the consideration of these factors, we conclude that the Nicholson Variation does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

[1] Accession Nos. 20180821-5010, 20180821-5068. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20180821-5010 or 20180821-5068 in the "Numbers: Accession Number" field.

TABLE 3.4-9

Comparison of Nicholson Variation and the Southgate Proposed Route

Feature	Nicholson Variation	Proposed Route
Total length (miles)	0.7	0.4
Construction rights-of-way (acres) a/	8.9	4.7
Total number of parcels crossed	3	3
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	0	0
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural Land within construction right-of-way (acres) c/	4.4	2.3
Forested Land within construction right-of-way (acres)	0	0.1
Length adjacent to existing right-of-way (miles)	0	0

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

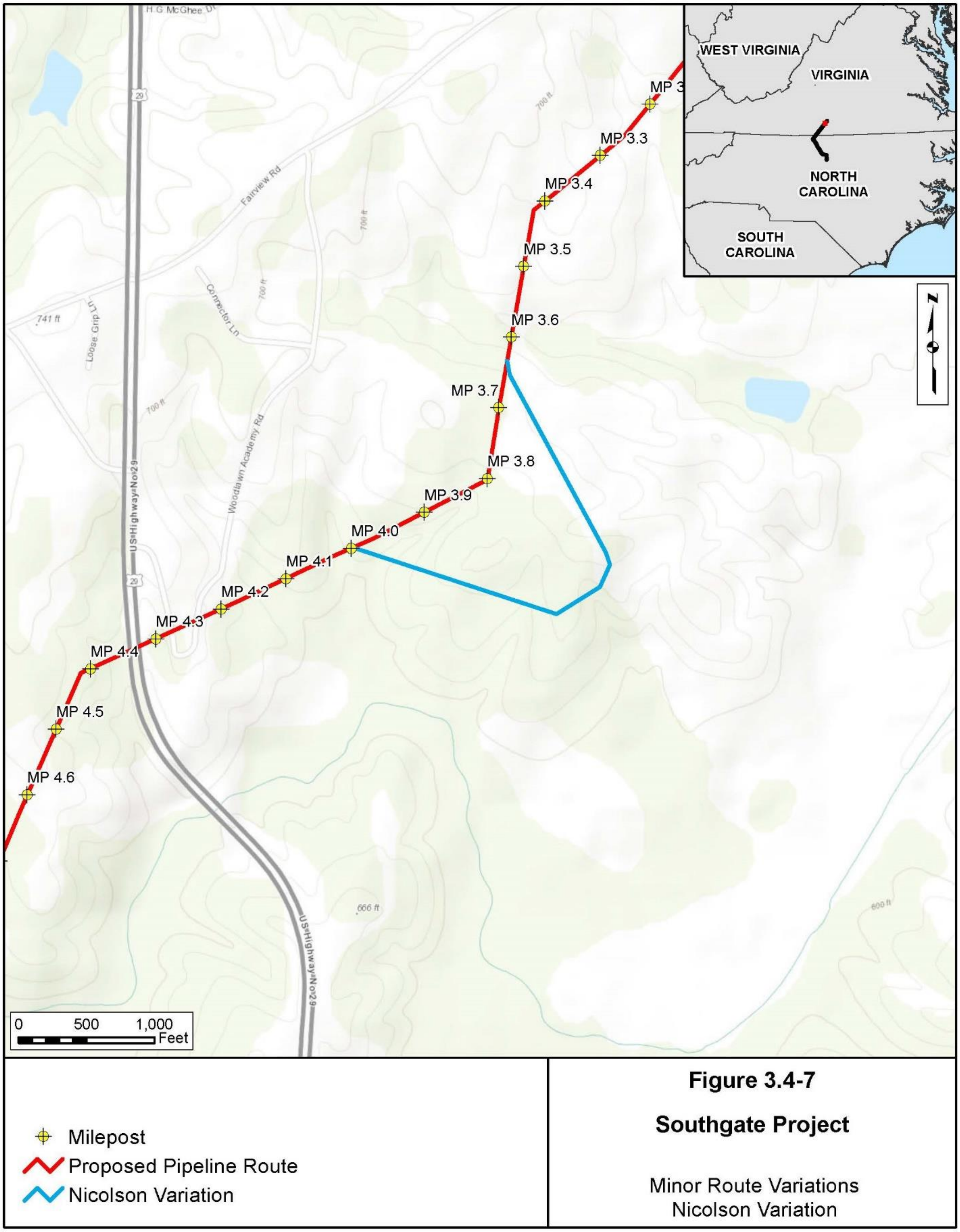


Figure 3.4-7

Southgate Project

Minor Route Variations
Nicolson Variation

3.4.3.2 Whitehead Variation

We evaluated the Whitehead Variation that Mountain Valley developed to avoid the Whitehead property and address comments submitted to the FERC Docket on September 11, 2018[2]. This variation deviates from the proposed route at MP 3.65 extending southeast and south before turning to cross U.S. Route 29, rejoining the proposed route at MP 5.1. Table 3.4-10 provides a comparison between the proposed route and the Whitehead Variation, and the location of the variation is shown on figure 3.4-8.

The Whitehead Variation would cross one less waterbody in comparison to the proposed route. However, the variation would be 0.3 mile longer; cross an additional parcel; and impact an additional 3.3 acres of agricultural land. It would also affect an additional 0.2 acre of wetland and 2.7 acres of forested land than the proposed route. Given the consideration of these factors, we conclude that the Whitehead Variation does not offer a significant environmental advantage when compared to the proposed route and is eliminated from further consideration.

TABLE 3.4-10

Comparison of Whitehead Variation and the Southgate Proposed Route

Feature	Whitehead Variation	Proposed Route
Total length (miles)	1.8	1.5
Construction rights-of-way (acres) a/	21.5	18.1
Total number of parcels crossed	11	10
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	1	2
Number of NWI wetlands crossed	1	1
Total NWI wetland crossing length (feet)	315	200
NWI wetlands within construction right-of-way (acres) b/	0.5	0.3
Agricultural Land within construction right-of-way (acres) c/	5.9	2.6
Forest Areas (miles)	0.6	0.3
Forested Land within construction right-of-way (acres)	7.5	4.8
Length adjacent to existing right-of-way (miles)	0	0.6

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

[2] Accession Nos. 20180911-5002. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20180911-5002 in the "Numbers: Accession Number" field.

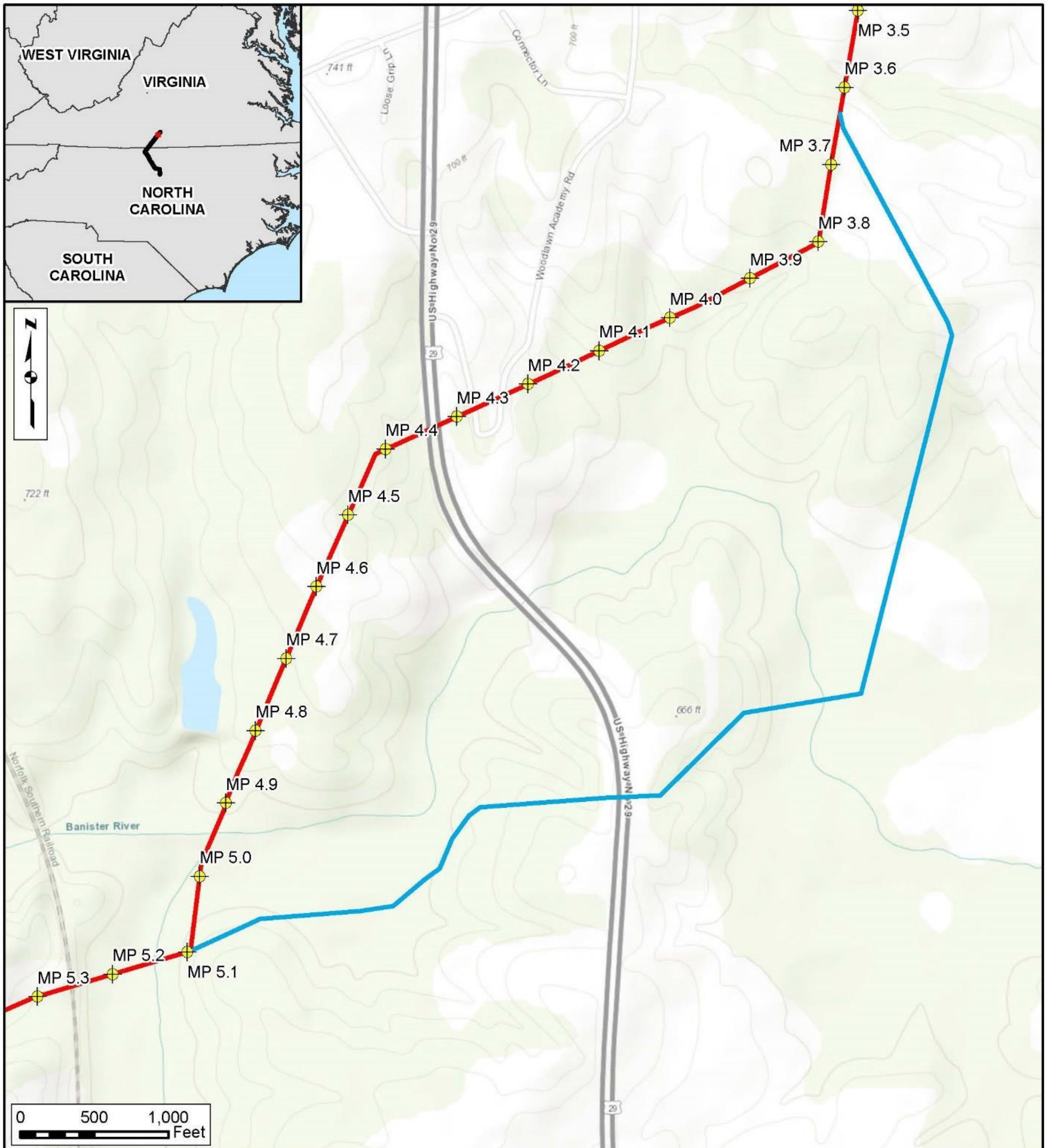


Figure 3.4-8

Southgate Project

Minor Route Variations
Whitehead Variation

3.4.3.3 Robert Pollok-Hill View Farms Variation

We evaluated this variation developed by Mountain Valley to avoid and/or minimize impacts on the Robert Pollok-Hill View Farms. This variation deviates from the proposed route at MP 14.7 extending west of the proposed route, paralleling an existing utility easement, crossing Whitmell School Road/County Road 750, rejoining the proposed route at MP 15.7. Table 3.4-11 provides a comparison between the proposed route and the Robert Pollok-Hill View Farms Variation, and the location of the variation is shown on figure 3.4-9.

The Robert Pollok-Hill View Farms Variation would affect 0.5 acre less of forest land and collocate with 1.0 mile more of existing rights-of-way in comparison with the proposed route. However, the proposed route would affect 0.2 acre less of agricultural land and cross one less property. While the entire variation was not incorporated into the proposed route, Mountain Valley has meet with Mr. Robert Pollok and has incorporated workspace adjustments at the landowners request to avoid a sediment catch area and a pond on the property. Mountain Valley has also eliminated approximately 1,300 feet of access road and 0.3 acre of temporary workspace on the property between MPs 14.7 and 15.7. Mountain Valley continues to meet with Mr. Robert Pollok to refine the Project footprint and reduce impacts on the property. Given the consideration of these factors, we conclude that the Robert Pollok-Hill View Farm Variation does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route and is eliminated from further consideration.

TABLE 3.4-11

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

Feature	Robert Pollok-Hill View Farms Variation	Proposed Route
Total length (miles)	1.0	1.0
Construction rights-of-way (acres) a/	12.3	12.3
Permanent rights-of-way (acres) a/	6.1	6.1
Total number of parcels crossed	6	5
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	0	0
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural Land within construction right-of-way (acres) c/	9.1	8.9
Forested Land within construction right-of-way (acres)	2.3	2.8
Length adjacent to existing right-of-way (miles)	1.0	0.0

a/ Assuming 100-foot-wide construction right-of-way.

b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

c/ Includes pasture/hay and cultivated crops.

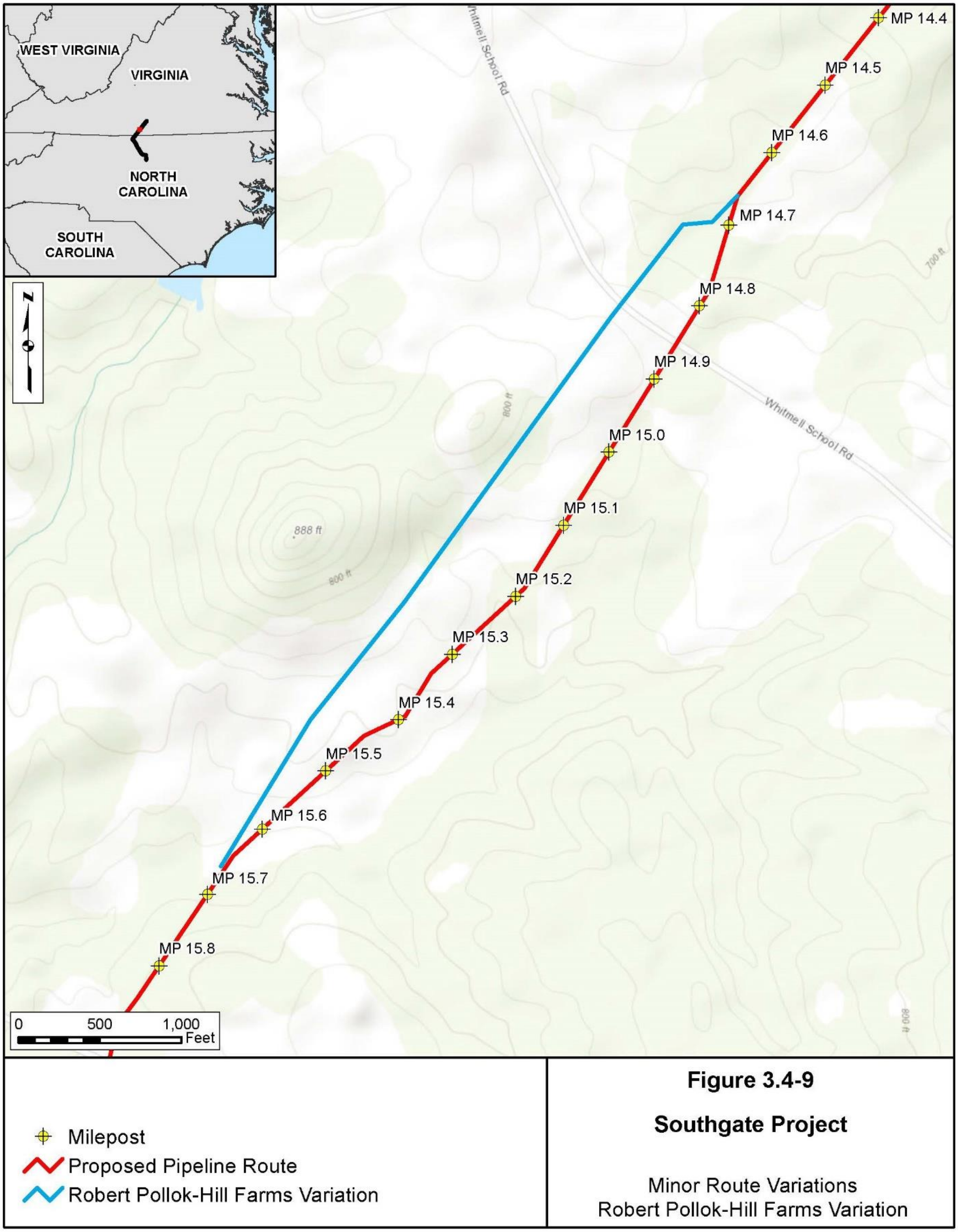


Figure 3.4-9

Southgate Project

Minor Route Variations
Robert Pollok-Hill Farms Variation

3.4.3.4 Moore Variation

We evaluated the Moore Variation developed by Mountain Valley to avoid impacts on the Moore property, addressing comments submitted to the FERC Docket on August 20, 2018[3]. This variation deviates from the proposed route at MP 33.1 extending south and southeast crossing Moir Road, turning south and southwest rejoining the proposed route at MP 33.9. Table 3.4-12 provides a comparison between the proposed route and the Moore Variation, and the location of the variation is shown on figure 3.4-10.

The Moore Variation would affect 1.2 miles more agricultural land, 4.6 additional acres of forested land, cross three additional parcels, and would be collocated 0.7 mile less than the proposed route. Given the consideration of these factors, we conclude that the Moore Variation does not offer an environmental advantage when compared to the proposed route and is eliminated from further consideration. Mountain Valley continues to refine the Project footprint and reduce impacts on the Moore property.

TABLE 3.4-12

Comparison of the Moore Variation and the Southgate Proposed Route

Feature	Moore Variation	Proposed Route
Total length (miles)	0.9	0.8
Construction rights-of-way (acres) a/	11.4	10.4
Total number of parcels crossed	7	4
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	2	2
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural Land within construction right-of-way (acres) c/	1.2	0
Forest Areas (miles)	0.7	0.3
Forested Land within construction right-of-way (acres)	8.4	3.8
Length adjacent to existing right-of-way (miles)	0	0.7

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

[3] Accession Nos. 20180821-5010, 20180821-5068. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20180821-5010 or 20180821-5068 in the "Numbers: Accession Number" field.

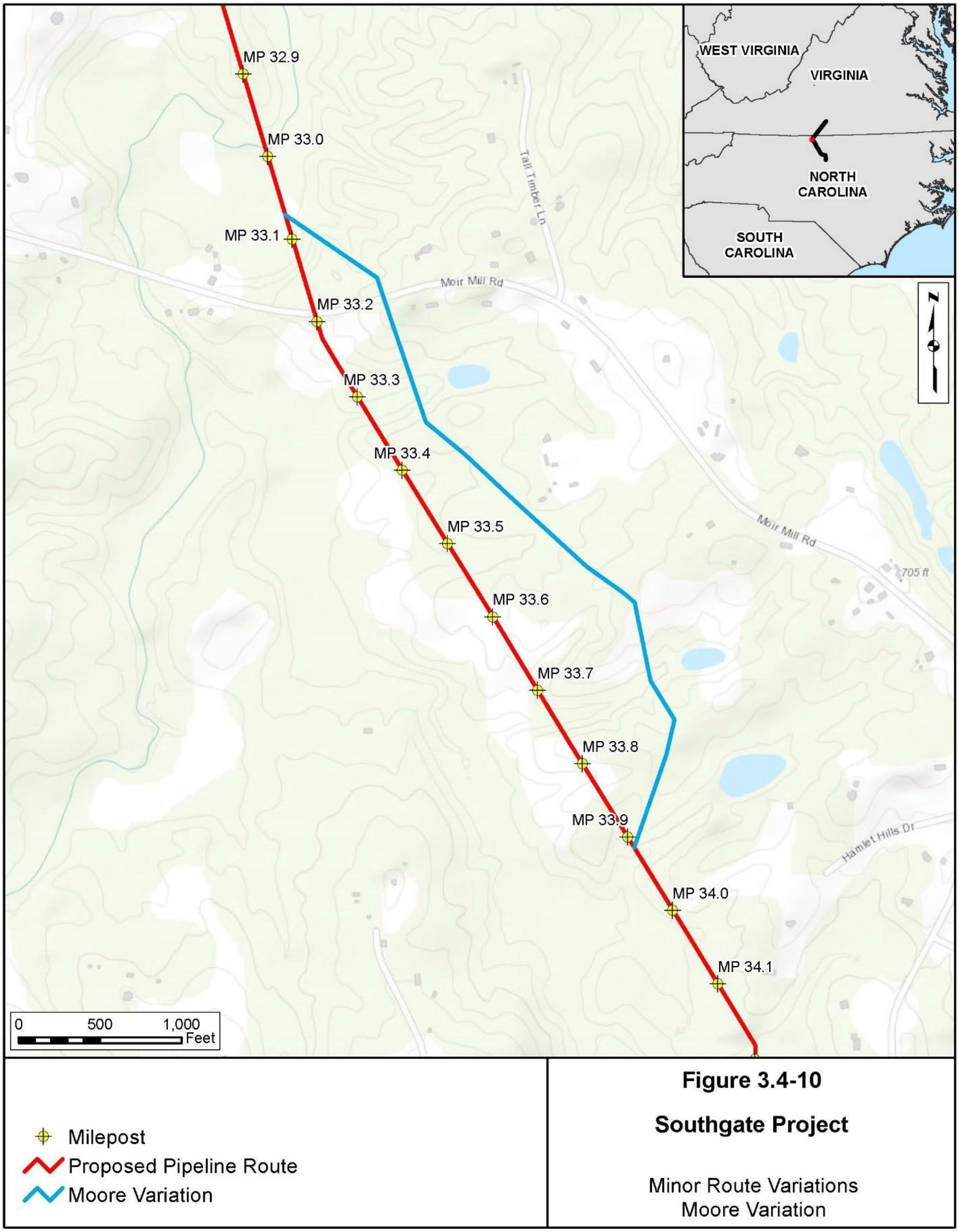


Figure 3.4-10

Southgate Project

Minor Route Variations
Moore Variation

3.4.3.5 Strader Variation

We considered this variation developed by Mountain Valley to avoid and/or minimize impacts on residences on the Strader property. This variation deviates from the proposed route at MP 40.0 extending south and southwest, crossing Narrow Gauge Road, turning east and southeast to rejoin the proposed route at MP 41.4. Table 3.4-13 provides a comparison between the proposed route and the Strader Variation, and the location of the variation is shown on figure 3.4-11.

The Strader Variation is not within 50 feet of any residences, whereas the proposed route is within 50 feet of one residence. The Strader Variation would affect two fewer parcels compared to the proposed route. However, the variation would be 0.1 mile longer, and impact an additional 0.1 acre of wetland, 1.0 acres of agricultural land, and 1.6 acres of forest land than the proposed route. In addition, the proposed route is collocated for 0.3 mile more than is the variation. While the entire variation was not incorporated into the proposed route, Mountain Valley has modified the proposed route to minimize impacts on the property based on meetings with Mr. and Ms. Strader. The Strader Variation does offer some advantages, but when considering all affected resources, does not offer a significant environmental advantage when compared to the proposed route.

TABLE 3.4-13

Comparison of the Strader Variation and the Southgate Proposed Route

Feature	Strader Variation	Proposed Route
Total length (miles)	1.6	1.5
Construction rights-of-way (acres) a/	19.8	18.1
Total number of parcels crossed	8	10
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	1/1
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	3	3
Number of NWI wetlands crossed	1	1
Total NWI wetland crossing length (feet)	303	243
NWI wetlands within construction right-of-way (acres) b/	0.5	0.4
Agricultural Land within construction right-of-way (acres) c/	2.2	1.2
Forested Land within construction right-of-way (acres)	12.9	11.3
Length adjacent to existing right-of-way (miles)	0.2	0.5

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

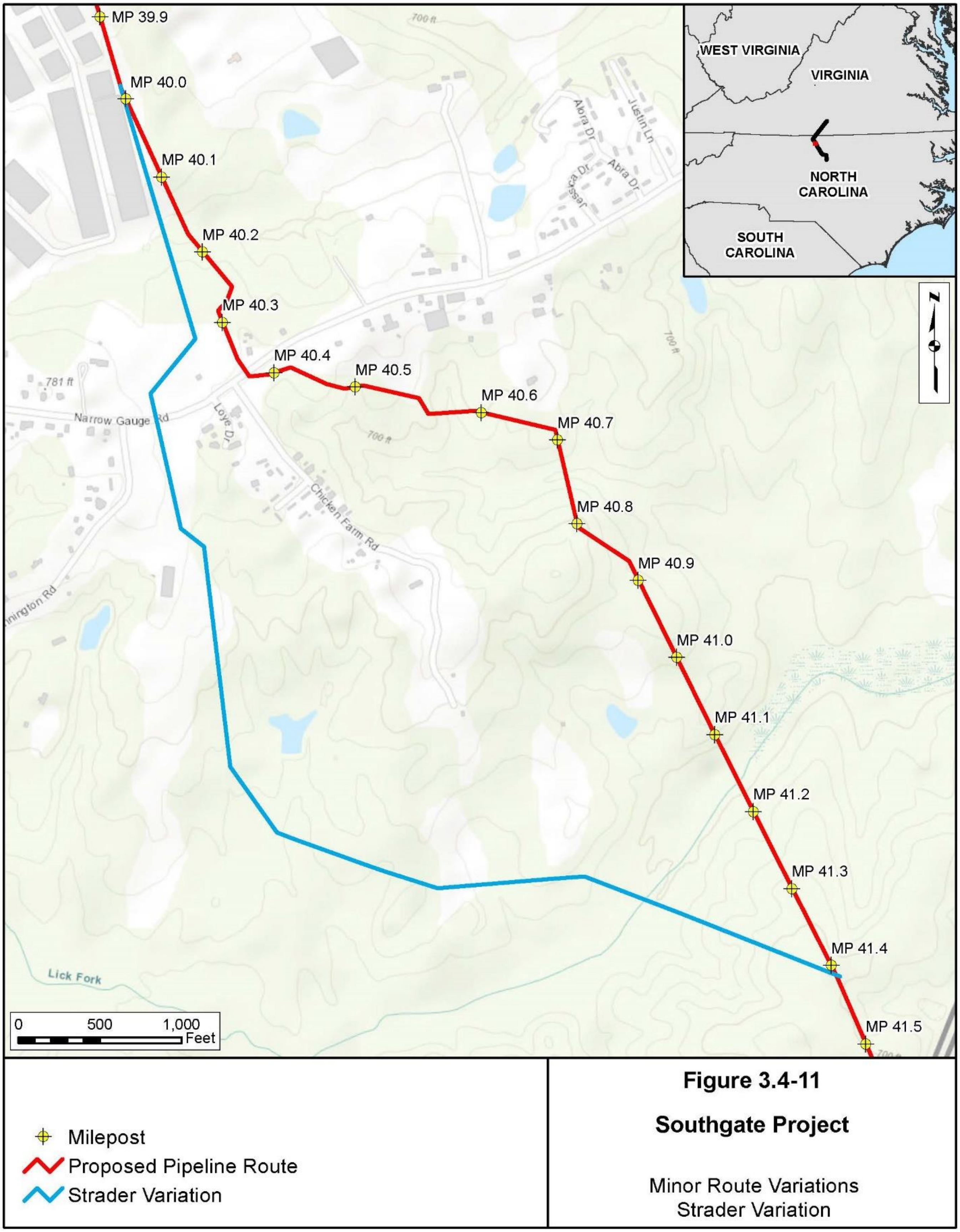


Figure 3.4-11

Southgate Project

Minor Route Variations
Strader Variation

3.4.3.6 Madrin Variation

FERC evaluated this variation developed by Mountain Valley to avoid impacts on the Madrin property, addressing comments submitted to the FERC Docket on August 23, 2018[4]. This variation deviates from the proposed route at MP 58.1 extending south and southeast, turning east and southeast paralleling an existing electric transmission easement, rejoining the proposed route at MP 58.9. Table 3.4-14 provides a comparison between the proposed route and the Madrin Variation, and the location of the variation is shown on figure 3.4-12.

The Madrin Variation would be 0.4 mile longer; require 4.8 acres more of construction rights-of-way; cross two additional parcels; one additional wetland; and impact an additional 4.1 acres of forested land. Given the consideration of these factors, we conclude that the Madrin Variation does not offer a significant environmental advantage when compared to the proposed route and is eliminated from further consideration.

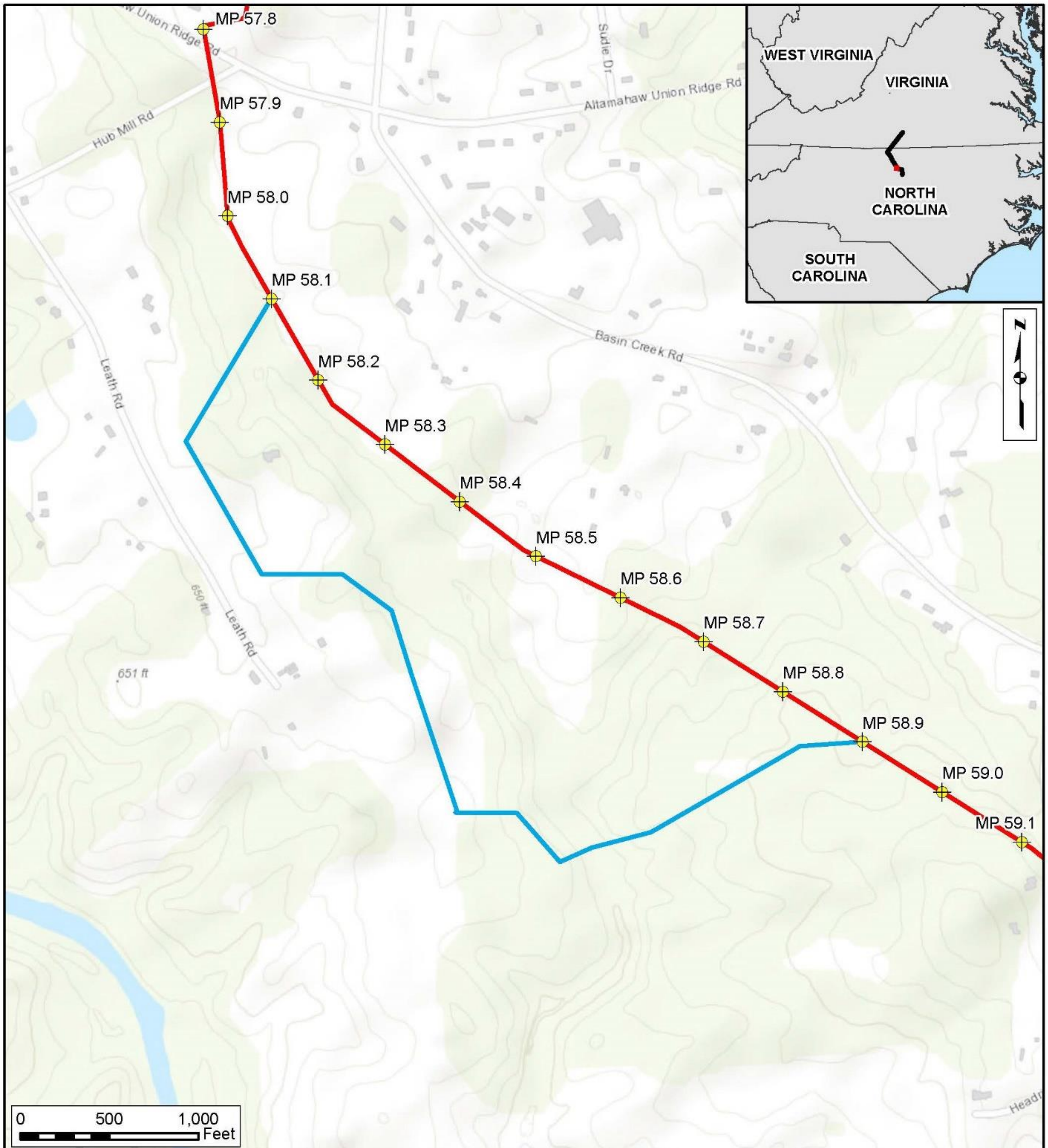
TABLE 3.4-14

Comparison of the Madrin Variation and the Southgate Proposed Route

Feature	Madrin Variation	Proposed Route
Total length (miles)	1.2	0.8
Construction rights-of-way (acres) a/	14.7	9.9
Total number of parcels crossed	7	5
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	1	1
Number of NWI wetlands crossed	2	1
NWI wetlands within construction right-of-way (acres) b/	0.1	0.1
Agricultural Land within construction right-of-way (acres) c/	4.3	4.2
Forested Land within construction right-of-way (acres)	9.7	5.6
Length adjacent to existing right-of-way (miles)	0.2	0.1

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

4 Accession Nos. 20180823-5084. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20180823-5084 in the "Numbers: Accession Number" field.



Milepost
Proposed Pipeline Route
Madrin Variation

Figure 3.4-12

Southgate Project

Minor Route Variations
Madrin Variation

3.4.3.7 Bombardier Variation

We considered this variation developed by Mountain Valley to avoid impacts on the Bombardier property, addressing comments submitted to the FERC Docket on August 20, 2018[5]. This variation deviates from the proposed route at MP 59.0, extending southeast and east crossing Danieley Water Wheel Road, and rejoining the proposed route at MP 59.4. Table 3.4-15 provides a comparison between the proposed route and the Bombardier Variation, and the location of the variation is shown on figure 3.4-13.

The Bombardier Variation would impact 0.5 acre less of forested land in comparison to the proposed route. However, the variation would be 0.1 mile longer, require an additional 0.5 acre of construction rights-of-way, and impact an additional 0.2 acre of agricultural land in comparison to the proposed route. The Bombardier Variation has some advantages and, overall, would result in resource impacts that are similar to the proposed route. Consequently, the variation does not provide a significant environmental advantage when compared to the proposed route and is eliminated from further consideration.

TABLE 3.4-15

Comparison of the Bombardier Variation and the Southgate Proposed Route

Feature	Bombardier Variation	Proposed Route
Total length (miles)	0.5	0.4
Construction rights-of-way (acres) a/	5.7	5.2
Total number of parcels crossed	5	5
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	0	0
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural Land within construction right-of-way (acres) c/	2.1	1.9
Forested Land within construction right-of-way (acres)	2.8	3.3
Length adjacent to existing right-of-way (miles)	0	0

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.

5 Accession Nos. 20180821-5010, 20180821-5068. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20180821-5010 or 20180821-5068 in the "Numbers: Accession Number" field.

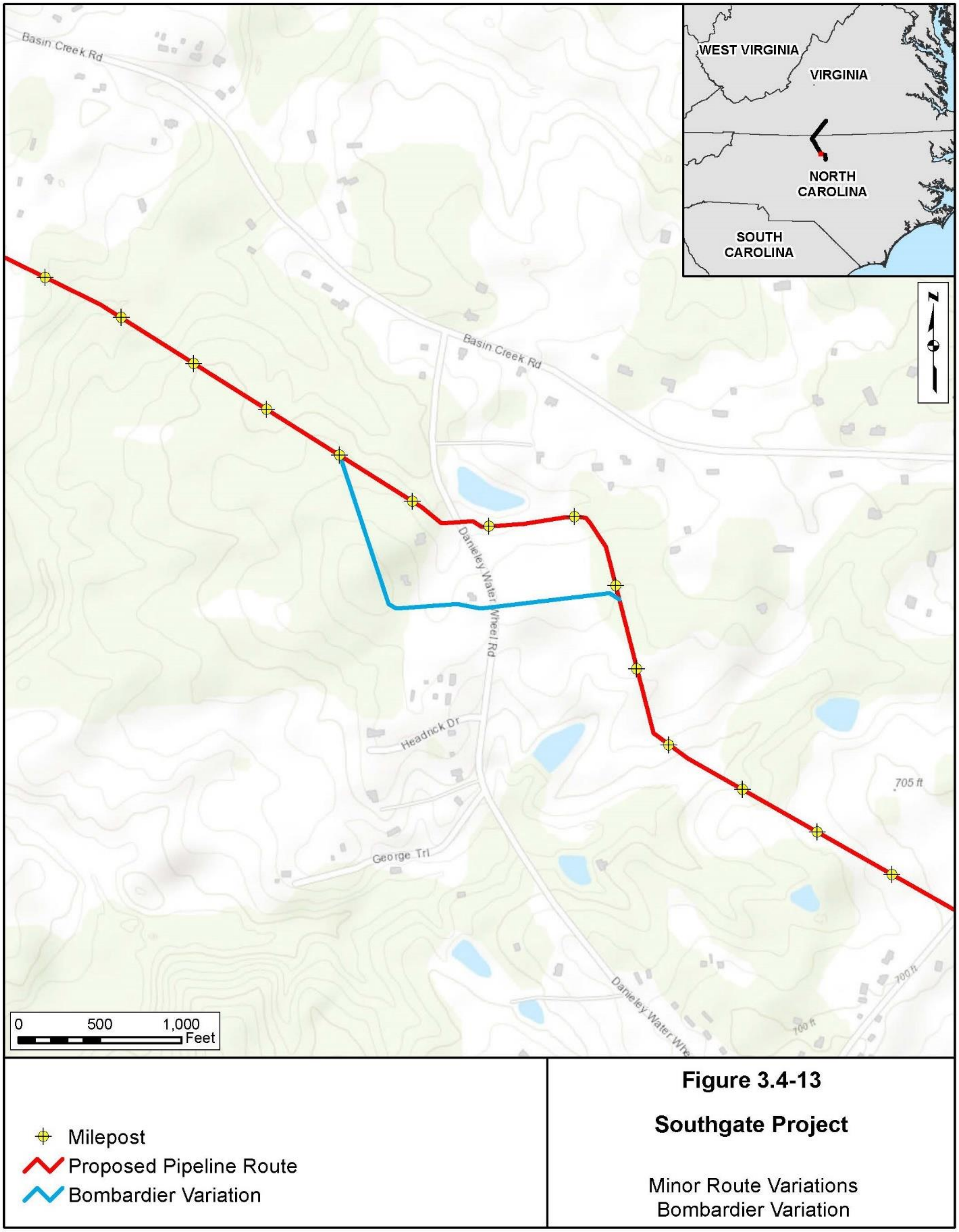


Figure 3.4-13

Southgate Project

Minor Route Variations
Bombardier Variation

3.4.3.8 Shambley Variations

We evaluated two variations developed by Mountain Valley to avoid or reduce impacts on the site of a planned home and septic system on the Shambley property, addressing comments submitted to the FERC Docket[6] on December 3, 2018. Shambley Variation 1 deviates from the proposed route at MP 59.0 extending southeast and east crossing Danieley Water Wheel Road, rejoining the proposed route at MP 59.58. Shambley Variation 2 deviates from the proposed route at MP 59.4 extending east, southeast, and south rejoining the proposed route at MP 59.77. Table 3.4-16 provides a comparison between the proposed route and the Shambley Variation 1, and table 3.4-17 provides a comparison between the proposed route and Shambley Variation 2. The location of both variations is shown on figure 3.4-14.

The Shambley Variation 1 would cross the driveway for the Shambley property approximately 100 feet from the intersection with Danieley Water Wheel Road and the southwestern corner of the property. The variation is 0.02 miles less, requires 0.2 acres less of construction rights-of-way, crosses one fewer parcel, and affects 1.4 less acres of forested land in comparison to the proposed route. Shambley Variation 1 crosses an additional 0.7 acres of agricultural land compared to the proposed route. The Shambley Variation 2 crosses the northeast corner of the Shambley property and impacts 0.4 acres less of agricultural land. The variation is 0.04 miles longer, would require 0.4 acres of additional construction rights-of-way, and impacts an additional 1.0 acre of forest land compared to the proposed route. At this time, Mountain Valley has not been granted permission to survey the Shambley property and map the locations of the planned home and septic system. Additionally, both the Shambley Variation 1 and the Shambley Variation 2 impact property owners not previously crossed by the Project. Given these factors, we conclude that the Shambley Variation 1 or Shambley Variation 2 do not offer a significant environmental advantage when compared to the proposed route. However, we recommend that Mountain Valley work with the land owner to minimize impacts to the Shambley property once the location of the planned home and septic system is obtained.

[6] 20181203-5013, 20181203-5059. These comments can be viewed on the FERC website at http://www.ferc.gov. Using the “eLibrary” link, select “Advanced Search” from the eLibrary menu and enter 20181203-5013 or 20181203-5059 in the “Numbers: Accession Number” field.

TABLE 3.4-16

Comparison of the Shambley Variation 1 and the Southgate Proposed Route

Feature	Shambley Variation 1	Proposed Route
Total length (miles)	0.56	0.58
Construction rights-of-way (acres) a/	7.0	7.2
Total number of parcels crossed	6	7
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of potable water wells within 150 feet of pipeline d/	Data not available	Data not available
Number of septic systems within 150 feet of pipeline d/	Data not available	Data not available
Number of waterbodies crossed	1	1
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural land within construction right-of-way (acres) c/	2.0	1.3
Forested land within construction right-of-way (acres)	3.1	4.5
Length adjacent to existing right-of-way (miles)	0	0

a/ Assuming 100-foot-wide construction right-of-way.

b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

c/ Includes pasture/hay and cultivated crops.

d/ Field surveys have not been completed as of June 2019 due to lack of survey access. Mountain Valley anticipates completion of field surveys in third quarter 2019.

TABLE 3.4-17

Comparison of the Shambley Variation 2 and the Southgate Proposed Route

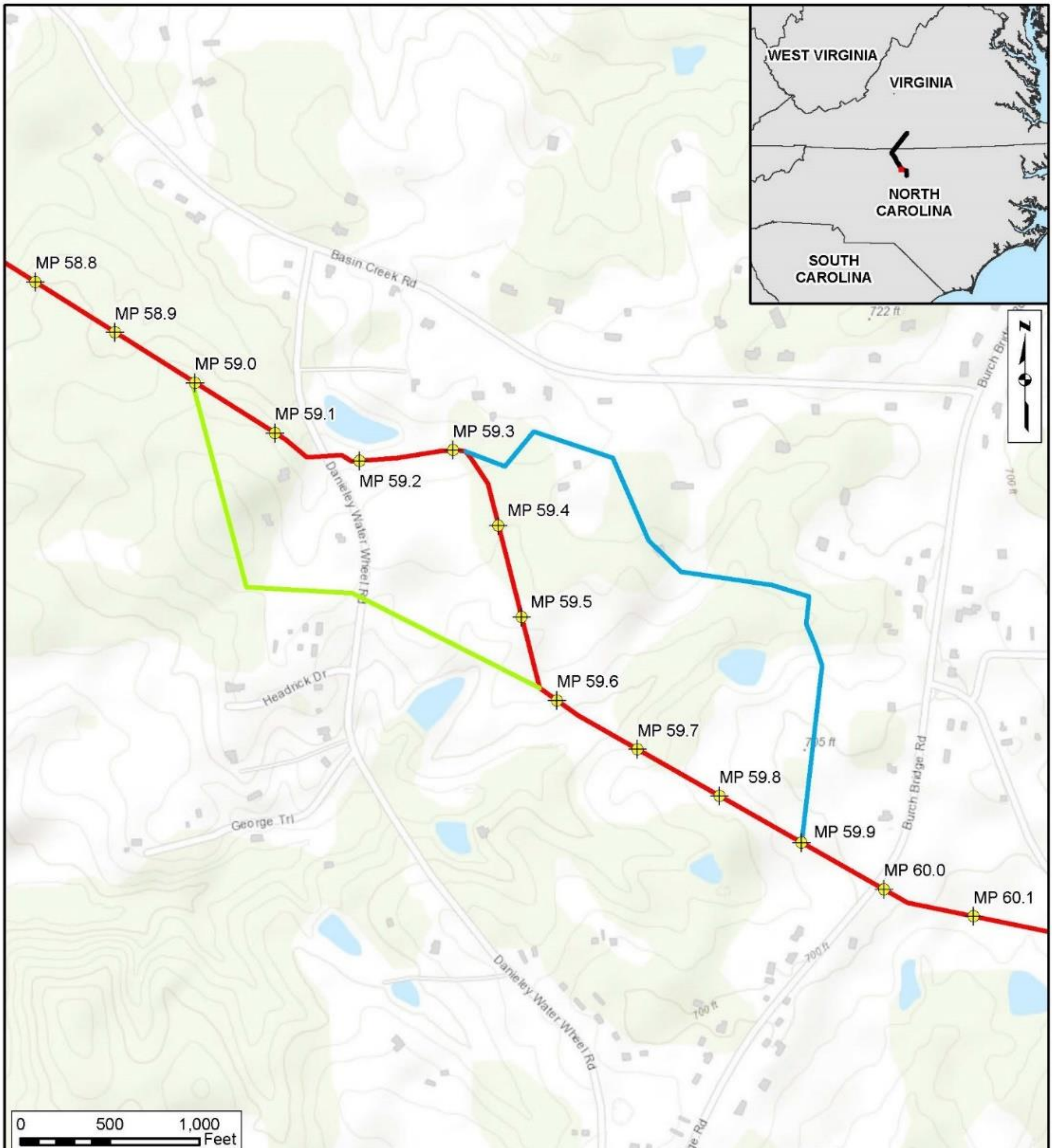
Feature	Shambley Variation 2	Proposed Route
Total length (miles)	0.42	0.38
Construction rights-of-way (acres) a/	5.2	4.8
Total number of parcels crossed	7	5
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	0/0	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of potable water wells within 150 feet of pipeline d/	Data not available	Data not available
Number of septic systems within 150 feet of pipeline d/	Data not available	Data not available
Number of waterbodies crossed	1	1
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural land within construction right-of-way (acres) c/	2.4	2.8
Forested land within construction right-of-way (acres)	3.1	2.1
Length parallel or adjacent to existing right-of-way (miles)	0	0.2

a/ Assuming 100-foot-wide construction right-of-way.

b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

c/ Includes pasture/hay and cultivated crops.

d/ Field surveys have not been completed as of June 2019 due to lack of survey access. Mountain Valley anticipates completion of field surveys in third quarter 2019.



Milepost
Proposed Pipeline Route
Shambley Variation 1
Shambley Variation 2

Figure 3.4-14

Southgate Project

Minor Route Variations
Shambley Variations 1 and 2

3.4.3.9 Martin Marietta Variation

The Martin Marietta Variation was developed to minimize potential impacts to current and future mining operations at the East Alamance Quarry. Martin Marietta Variation deviates from the proposed route at MP 66.9 extending southwest and southeast to rejoin the proposed route at MP 67.12. Table 3.4 18 provides a comparison between the proposed route and the Martin Marietta Variation, and the location of the variation is shown on figure 3.4-15. The Martin Marietta Variation would cross an additional 2.0 acres of agricultural land and 0.9 acre of forested land and be within 50 feet of one residence in comparison to the proposed route. All other resource impacts are similar. The Martin Marietta Variation has some advantages and, overall, would result in resource impacts that are similar to the proposed route. Consequently, the variation does not provide a significant environmental advantage when compared to the proposed route.

The Martin Marietta Variation would be a maximum of 102 feet and a minimum of 45 feet further from the East Alamance Quarry property line compared to the proposed route. The proposed route would require 0.5 acres of construction easement while the variation would avoid the East Alamance Quarry property and not require a construction easement. The Martin Marietta Variation would not impact current operations while the proposed route would cause mining production delays during construction. Mountain Valley is coordinating with Martin Marietta to discuss future operations and refine the Project footprint to reduce impacts at the East Alamance Quarry property.

TABLE 3.4-18

Comparison of the Martin Marietta Variation and the Southgate Proposed Route

Feature	Martin Marietta Variation	Proposed Route
Total length (miles)	0.2	0.2
Construction rights-of-way (acres) a/	2.3	2.3
Total number of parcels crossed	2	2
Maximum Distance from Center of Easement to Quarry Property line (feet)	191	89
Minimum Distance from Center of Easement to Quarry Property line (feet)	45	0
Construction right-of-way impacting Quarry Property (acres)	0	0.5
Permanent right-of-way impacting Quarry Property (acres)	0	0.3
Number of residences within 25 and 50 feet of the edge of the construction ROW	0/1	0/0
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	0	0
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural land within construction right-of-way (acres) c/	2.0	0
Forested land within construction right-of-way (acres)	0.9	0
Length adjacent to existing right-of-way (miles)	0	0

a/ Assuming 100-foot-wide construction right-of-way.

b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.

c/ Includes pasture/hay and cultivated crops.

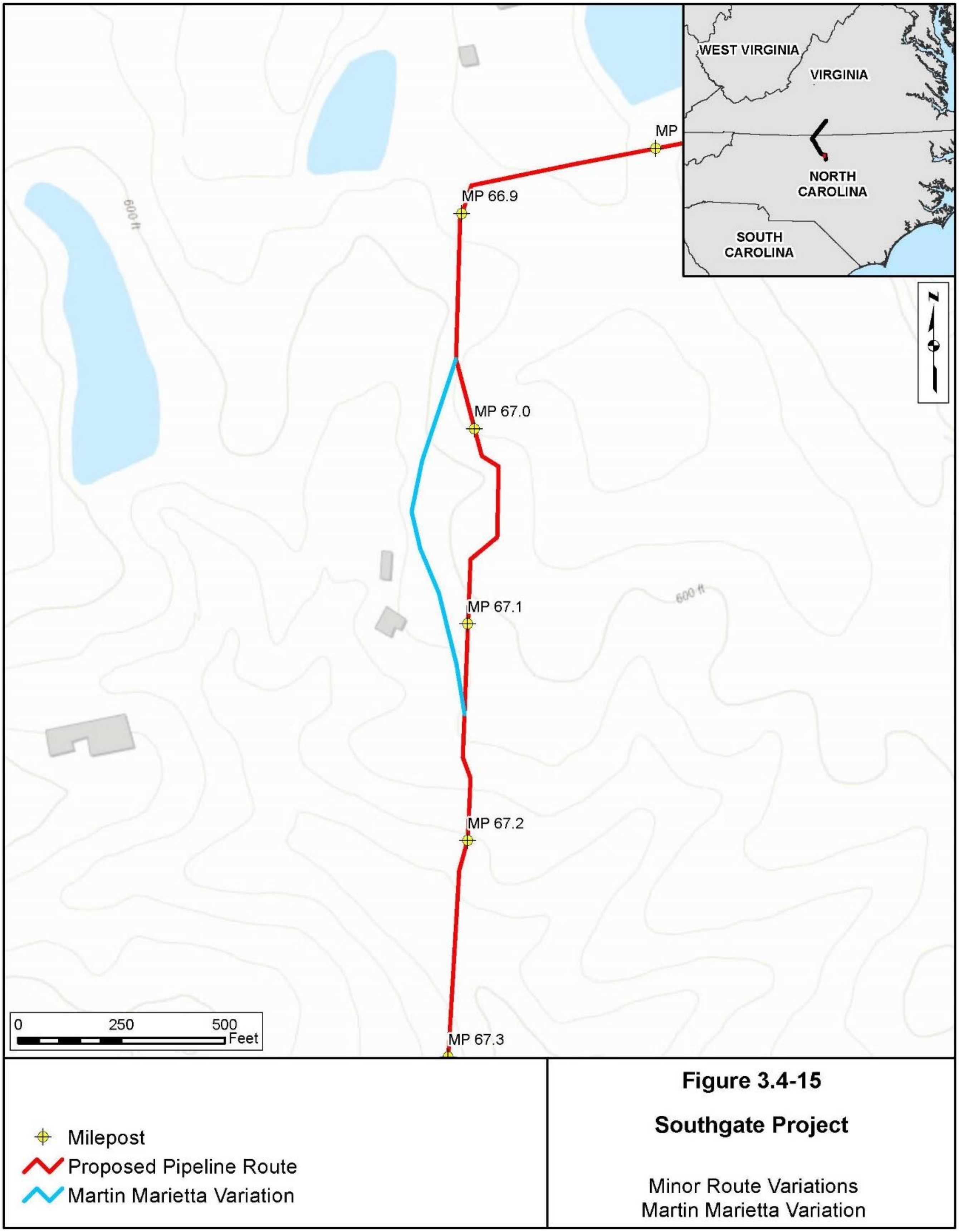


Figure 3.4-15

Southgate Project

Minor Route Variations
Martin Marietta Variation

3.4.3.10 Town of Haw River Variation

The Town of Haw River Variation was developed by Mountain Valley to reduce impacts on the Town of Haw River. The variation was developed from stakeholder input to minimize impacts from the construction phase of the Project and avoid operational impacts to the Haw River Fire Station. The variation deviates from the proposed route at MP 69.52 extending south to cross East Main Street and railroad tracks, and turning southeast and east rejoining the proposed route at MP 69.95. Table 3.4-19 provides a comparison between the proposed route and the Town of Haw River Variation, and the location of the variation is shown on figure 3.4-16.

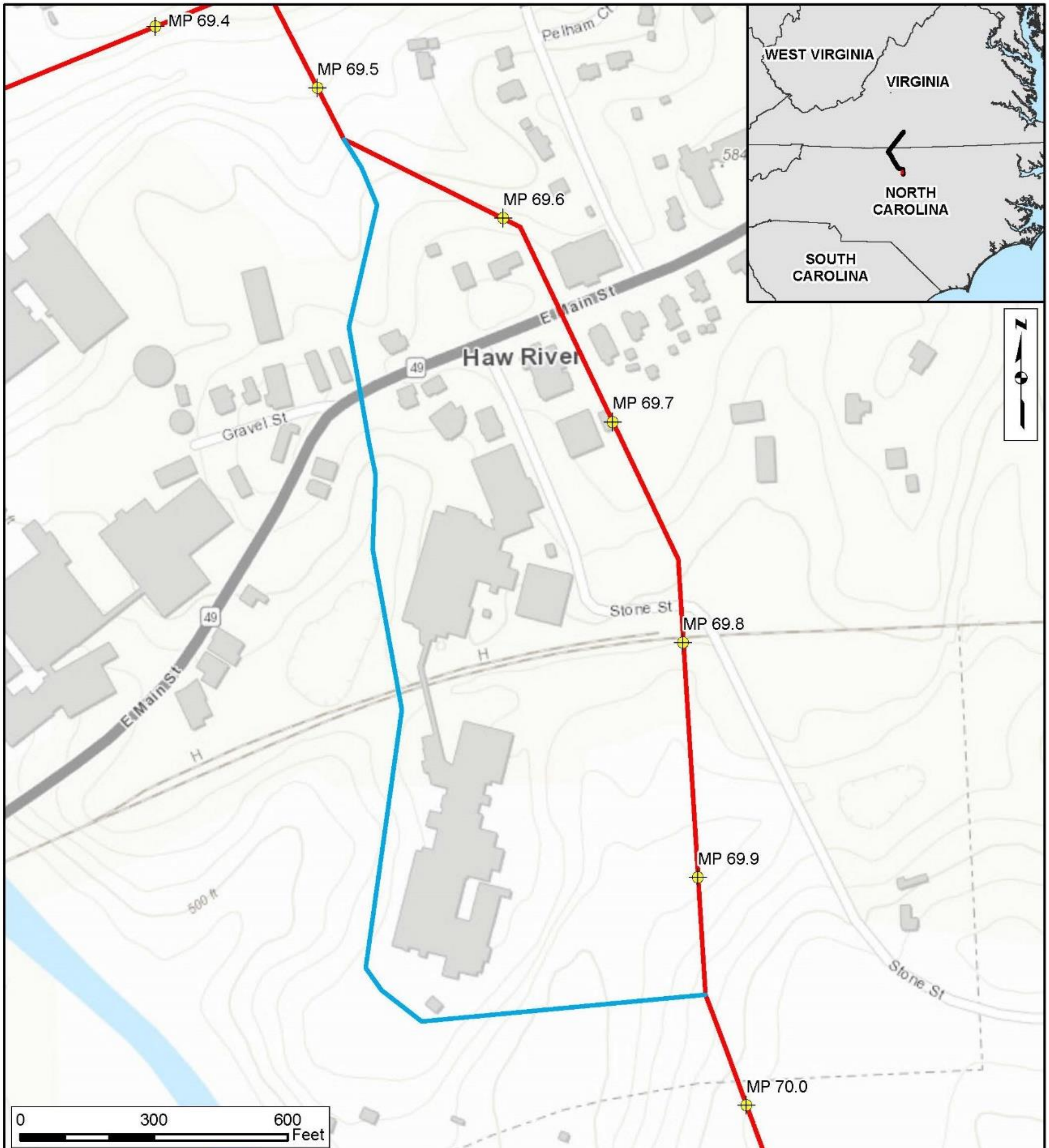
The Town of Haw River Variation is collocated with 0.3 miles of additional rights-of-way, and crosses 0.2 acres less of forested land, three less parcels, and has one less residence within 25 feet in comparison to the proposed route. However, the variation would require 1.1 acres more of construction rights-of-way in comparison to the proposed route. The Town of Haw River Variation would result in resource impacts that are similar to the proposed route. Consequently, the variation does not provide a significant environmental advantage when compared to the proposed route. Mountain Valley continues to work with stakeholders in the Town of Haw River to refine the route to reduce impacts to the fire station and impacts from the construction phase of the Project.

TABLE 3.4-19

Comparison of the Town of Haw River Variation and the Southgate Proposed Route

Feature	Town of Haw River Variation	Proposed Route
Total length (miles)	0.5	0.4
Construction rights-of-way (acres) a/	6.4	5.3
Total number of parcels crossed	8	11
Number of residences within 25 and 50 feet of the edge of the construction right-of-way	2/3	3/3
Unlisted/Potential Eligible Historic Properties (number)	0	0
Number of waterbodies crossed	1	1
Number of NWI wetlands crossed	0	0
NWI wetlands within construction right-of-way (acres) b/	0	0
Agricultural land within construction right-of-way (acres) c/	0	0
Forested land within construction right-of-way (acres)	1.8	2.0
Length adjacent to existing right-of-way (miles)	0.3	0

a/ Assuming 100-foot-wide construction right-of-way.
b/ National Wetlands Inventory (NWI) and National Hydrography Dataset (NHD) data. Assuming 75-foot-wide construction right-of-way.
c/ Includes pasture/hay and cultivated crops.



Milepost
Proposed Pipeline Route
Town of Haw River Variation

Figure 3.4-16

Southgate Project

Minor Route Variations
Town of Haw River Variation

3.5 ABOVEGROUND FACILITY ALTERNATIVES

We did not evaluate alternative locations for meter stations because the locations of those facilities are largely determined by interconnections with other pipeline systems and delivery points, and the facilities have a relatively small footprint. Similarly, the locations of proposed MLVs are based in part on PHMSA regulations, and MLVs and other appurtenant aboveground facilities generally occupy only a small footprint within existing or proposed pipeline rights-of-way. We found the proposed location of the Lambert Compressor Station to be acceptable, and we did not receive comments from affected stakeholders concerning the siting. Given these factors, we did not evaluate any alternative sites for the meter stations, MLVs, or the Lambert Compressor Station.

3.5.1 Electric-driven Compression Alternatives

We evaluated the feasibility of using electric motor-driven compressors at the proposed Lambert Compressor Station as an alternative to the proposed natural gas-fired turbines. An existing high voltage electric transmission system is located approximately 1 mile from the Lambert Compressor Station. Its use would likely require an upgrade as well as a minimum of 1 mile of new, high voltage powerlines, and an additional substation within the Lambert Compressor Station site that would result in an increased size. The extensions of powerlines would have the disadvantages of its own set of environmental impacts with likely clearing of forest, modification of wildlife habitat, ground disturbance for installation of power poles, changes to visual setting, and permanent maintenance of a linear corridor in a grassy or scrub-shrub condition.

The energy needed to run the electric-driven compressors would be generated in the region, which includes a variety of power generation sources. We utilized the EPA's Emissions & Generation Resource Integrated Database (eGRID) to estimate the hypothetical regional greenhouse gases (GHGs), nitrogen oxides (NOx), and sulfur dioxide (SO_2) emissions that would occur if electric-driven compressor units were installed rather than natural gas-fired compressor units. The eGRID integrates many different federal data sources on power plants to allow for direct comparison of environmental attributes of electric generation within defined regions of the United States. A comparison of emissions is provided in table 3.4-20 for 21.6 megawatt (MW) of power, exclusive of the two Solar turbines that would be used for the compression and transmission of natural gas. Emissions of GHGs for purchased power are about 35 percent lower than those of natural gas-fired turbines, while emissions of NOx and SO_2 are about 44 percent and 446 percent higher, respectively. It is likely that the electrical power generation would be more than 21.6 MW due to line loss in the electrical transmission system. This would result in an increase in purchased power requirements.

TABLE 3.4-20

Comparison of Direct and Indirect Power Generation Emissions

Power Option	Annual Pollutant Emissions (tpy)		
	NOx	SO_2	GHGs
Natural Gas Turbine Emissions (Direct) a/	32.8	5.2	117,045
Purchased Power Emissions (Indirect) b/	47.3	28.4	76,641

Source: EPA, 2018a

a/ See table 4.11-3 for detailed information on emissions from each type of emission source at the Lambert Compressor Station.

b/ The indirect emission factors for GHG, NOx, and SO_2 are based on EPA data for 2016 for the SRVC eGRID subregion (SERC Virginia/Carolina).

As a result, the use of electric-driven compressors was not considered environmentally superior to natural gas compressors in terms of reducing regional emissions. Furthermore, although local air emissions from electric-driven compressors would be lower than those from natural gas driven compressors, use of electric-driven compressors could result in a higher load on the electric power grid and higher regional 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 ALTERNATIVES CONCLUSIONS

We reviewed alternatives to Mountain Valley's proposal based on our independent analysis and comments received. In all cases, we did not find an alternative that would provide a significant environmental advantage over the Project. Based on our findings we conclude that the proposed Project is the preferred alternative that can meet the Project's stated purpose.

4.0 ENVIRONMENTAL ANALYSIS

This section of the draft EIS describes the affected environment as it currently exists and discusses the environmental consequences of the proposed Project. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife and 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 Project 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 pre-construction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. This could include the time it takes for herbaceous/shrub vegetation to grow on the right-of-way after restoration. Impacts were considered long-term if the resource would require more than 3 years to recover. For example, although trees would be allowed to regenerate in temporary work areas, it would take decades for them to mature. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to pre-construction conditions during the life of the project (more than 50 years). The construction and operation of aboveground facilities would have permanent impacts.

When determining the significance of an impact, the geographic, biological, and/or social context in which the effects would occur, as well as the intensity (e.g., severity), were also considered. In the following sections, we address direct and indirect effects collectively by resource. Section 4.13 analyzes the Project's contribution to cumulative impacts.

As part of its proposal, Mountain Valley developed certain mitigation measures to reduce the impact of the Project so that impacts would not be significant. In some cases, we determined that additional mitigation measures could further reduce the Project's 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 any Order the Commission may issue authorizing this Project. The conclusions in the draft EIS are based on our analysis of the environmental impact and the following assumptions:

- the proposed facilities would be constructed and operated as described in section 2.0 of the draft EIS;
- Mountain Valley would implement the mitigation measures included in its application and supplemental submittals to the FERC; and
- Mountain Valley would comply with our recommended mitigation measures, listed in section 5.2.

In our experience, necessary modifications to a project, both spatial and procedural, are identified after it is authorized. These changes may include additional or different minor workspace configurations, changes to access roads, or even specific construction techniques (e.g., construction across waterbodies). These changes are often identified by the applicant once on-the-ground implementation work is initiated. Any Project modifications would be subject to review and approval from FERC's Director of the OEP and any other permitting/authorizing agencies with federal or federally delegated jurisdiction.

4.1 GEOLOGY

4.1.1 Geologic Setting

The Project would be in the Piedmont Upland section of the Piedmont physiographic province in Pittsylvania County, Virginia and Rockingham and Alamance Counties, North Carolina (Fenneman and Johnson, 1946). The Piedmont province is primarily underlain by weathered granite, gneiss, and schist bedrock of Proterozoic to Paleozoic age, with limited outcropping (Fenneman, 1938). The Piedmont Upland section is characterized by gentle slopes along a rolling surface, bounded or cut by valleys of greater depth and steeper slopes. In the Project vicinity, elevations range from 470 to 880 feet above mean sea level (Fenneman, 1938).

4.1.1.1 Surficial Geology

Surficial geology crossed by the Project has not been mapped in detail. However, the United States Geological Survey (USGS) Surficial Materials in the Conterminous United States map (Soller et al., 2009) depicts the Project area as mass-movement sediments consisting of colluvium, alluvial sediments, and loess, as well as residual materials formed from the weathering of metamorphic, sedimentary, and carbonate bedrock. These sediments range in grain size from clay to boulders, may contain organic material, and are poorly sorted and stratified (Soller and Reheis, 2004). Appendix C.1 and figure 4.1-1 present the surficial geology crossed by the Project.

4.1.1.2 Bedrock Geology

The bedrock along the Project route generally consists of Cambrian to Triassic Period granite, gneiss, sandstone, and schist (USGS, 2018a). Appendix C.2 contains a summary table of the bedrock crossed by the Project and figure 4.1-2 provides an illustration of bedrock types.

4.1.2 Mineral Resources

Information regarding mineral resources in Virginia and North Carolina was obtained though the Virginia Department of Environmental Quality (VADEQ, 2018a); Virginia Department of Mines, Minerals and Energy (VADMME [VADMME, 2018a; 2018b]); USGS (2016a); North Carolina Department of Environmental Quality (NCDEQ, 2018a) and the North Carolina Geological Survey (NCGS [NCGS, 2016]). Based on this review, active, inactive, abandoned, and proposed surface or subsurface extraction and deposits of fuel resources (coal, oil, and natural gas) were not identified within 0.25 mile of any Project workspaces.

Nonfuel mineral resources are extracted in the Project vicinity, including crushed stone, lithium minerals, phosphate, and sand and gravel. Commercially viable uranium deposits are also present in the Project vicinity in Virginia, notably, the Coles Hill deposit located 3.5 miles north of the Lambert Compressor Station. However, in 1982, Virginia enacted a moratorium on uranium mining, requiring that a program to regulate mining be established before the Commonwealth could accept uranium mining permit applications; to date this moratorium remains in place.

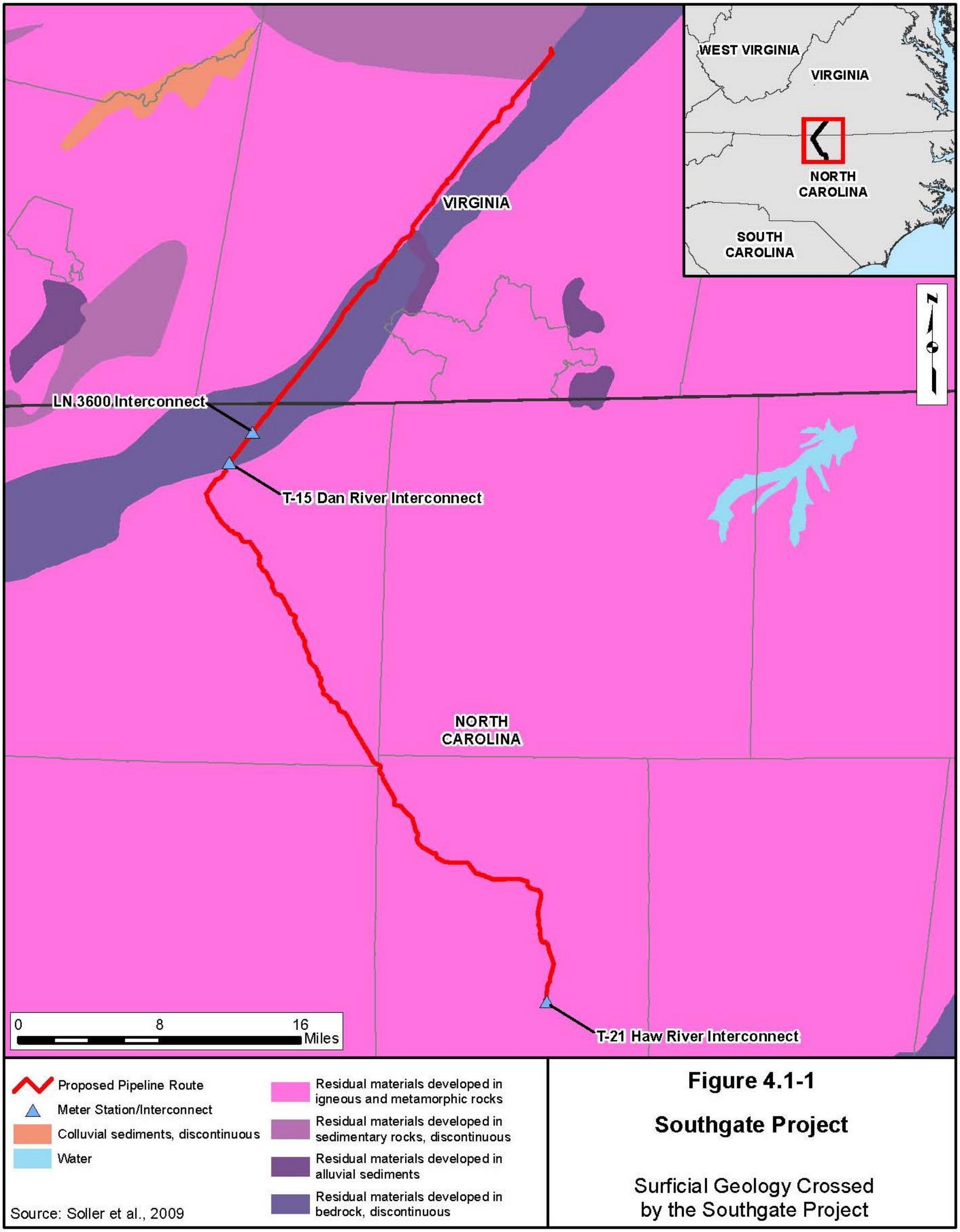


Figure 4.1-1

Southgate Project

Surficial Geology Crossed by the Southgate Project

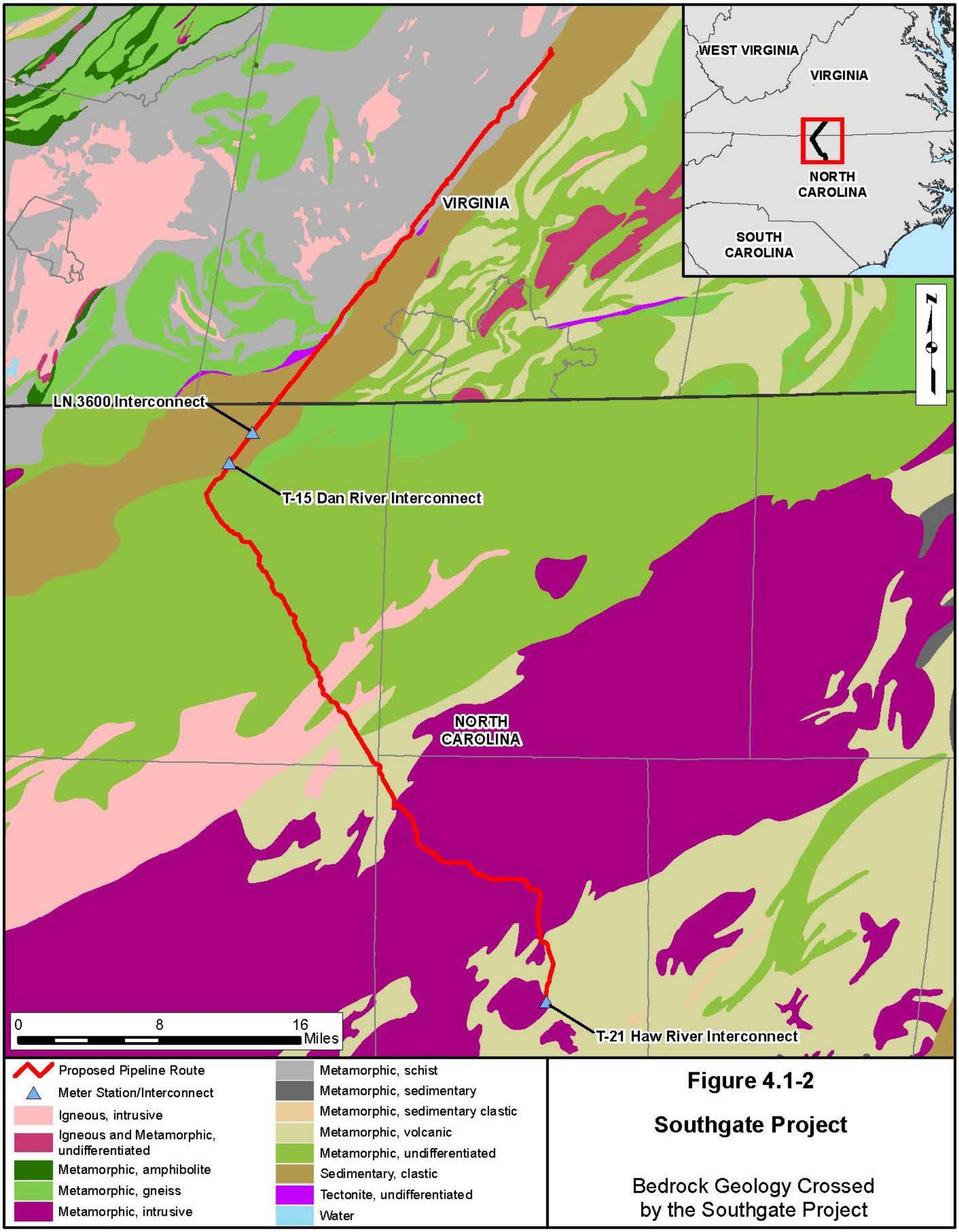


Figure 4.1-2

Southgate Project

Bedrock Geology Crossed by the Southgate Project

The East Alamance Quarry is a crushed stone aggregates operation in Haw River and is owned and operated by Martin Marietta Materials, Inc. (North Carolina Department of Environmental and Natural Resources Permit No. 01-08) on 600 acres of land, 375 acres of which are bound under Permit No. 01-08. This permit also provides limitations on blasting practices at the quarry, restricting maximum peak particle velocities to 1.0 inch per second. The Project alignment would cross parcels owned by the East Alamance Quarry for approximately 230 feet, near MP 67. Mountain Valley obtained public information that indicates that the operator has not yet filed for a mining permit on the parcel in question (NC-AL-128); however, through discussions with the operator, it was identified that future mining operations may be completed on this parcel. Mountain Valley therefore proactively rerouted the pipeline on this parcel in an attempt to minimize impacts on any future expansion of the East Alamance Quarry. Currently, the Project alignment is approximately 430 feet from disturbed areas at MP 66.7 and more than 1,200 feet from disturbed areas at MP 67. Mountain Valley has committed to working with the East Alamance Quarry regarding landowner easement agreements to minimize inconvenience and impact to the quarry. Based on these factors, we conclude that the Project would not significantly impact or be affected by the East Alamance Quarry.

The Project pipeline route would also be within 0.2 mile of a USGS-identified plant comprised of a rotary kiln, listed as a bloating materials (lightweight concrete aggregate products) commodity type (USGS, 2011). The site is mapped west of MP 26.6 in Rockingham County, North Carolina; however, an active plant site was not observed based on a review of recent aerial imagery. Further, given the distance from the Project boundary, no impacts from construction or operation of the Project are anticipated.

4.1.3 Paleontological Resources

There is the potential for the discovery of fossils along the Project pipeline route in areas of shallow sedimentary bedrock. Potential fossils that may occur within the Piedmont province include insects, freshwater fish, and dinosaur footprints in Triassic-age rift basin deposits (College of William and Mary, 2018a). Furthermore, the Project would be in the vicinity of Solite Quarry, which straddles the border between North Carolina and Virginia about 9 miles east of the Project boundary near MP 26.1. The Solite Quarry is known to contain preserved reptiles, fish, plant parts, and a variety of insect fossils from the Triassic Period. Fossils found in the Solite Quarry are typically well preserved in sandstone, mudstone, and lacustrine shales from the Cow Branch Formation (College of William and Mary, 2018b). Dinosaur body fossils have not been discovered at the Solite Quarry but the presence of specific trace fossils indicates that dinosaurs did exist in the area (Speights, 2018).

EIs would be trained to respond if suspected paleontological resources are identified during trench excavation or site preparation based on the Project-specific *Unanticipated Discovery Plan for Paleontological Resources*[1]. This plan requires that a paleontologist review any vertebrate fossil discovery before construction may proceed. The paleontologist would determine if the fossil

[1] Mountain Valley's Unanticipated Discovery Plan for Paleontological Resources was included as appendix 6-H to Resource Report 6 in its November 06, 2018, application. The Unanticipated Discovery Plan for Paleontological Resources can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

is of scientific significance, and if so they would contact FERC as well as the Virginia Division of Geology and Mineral Resources or the North Carolina Museum of Natural Sciences to develop a documentation and recovery plan. Based on comments from the NCDEQ, Mountain Valley contacted North Carolina state agencies in July and October of 2018 to determine the involvement of agency representatives during construction regarding unanticipated discoveries of paleontological resources. A response, to date, has yet to be received. Mountain Valley would continue to attempt consultation with North Carolina state agencies and would file updated correspondence as received. Given the above-described measures, we conclude that potential impacts on paleontological resources would be avoided or adequately mitigated.

4.1.4 Geologic Hazards

Geologic hazards evaluated for the proposed Project include seismicity (e.g., earthquakes), surface faults, soil liquefaction, landslides, karst terrain, subsidence, shallow bedrock, and the presence of uranium deposits in the Project vicinity. These hazards, as well as the feasibility of utilizing HDD, based on hydrogeologic conditions present in the Project area, are discussed below. The conditions necessary for the development of other geologic hazards, including avalanches and volcanism, are not present in the area of the Project and therefore not discussed.

4.1.4.1 Seismicity

The majority of 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 (such as in California), or where tectonic plates are converging (e.g., the Indian Sub-Continent). Unlike these highly active tectonic regions, the east coast of the United States is a passive tectonic plate boundary located on the "trailing edge" of the North American continental plate, which is relatively seismically quiet when compared with active plate boundaries in the United States, such as the San Andreas fault, a transformative plate boundary, and the Juan de Fuca convergent (subduction) plate boundary, both along the western coast of the United States. Earthquakes, however, do occur in the eastern United States, primarily due to trailing edge tectonics and residual stress released from past, mountain-building events.

The shaking during an earthquake can be expressed in terms of the acceleration as a percent of gravity (g), and seismic risk can be quantified by the motions experienced at the ground surface or by structures during a given earthquake expressed in terms of g. USGS National Seismic Hazard Probability Mapping shows that for the Project area, within a 50-year period, there is a 2 percent probability of an earthquake with an effective peak ground acceleration (PGA) of 6 to 8 percent g; and a 10 percent probability of an earthquake with an effective PGA of 2 to 3 percent g being exceeded (USGS, 2014). For reference, a PGA of 10 percent g (0.1g) is generally considered the minimum threshold for damage to older structures or structures not constructed to resist earthquakes.

The modified Mercalli scale (Modified Mercalli Intensity or MMI) measures the intensity of an earthquake at a particular location while the Richter scale measures the size of the earthquake at its source (USGS, 2016a). In general, modern pipeline systems have not sustained damage during seismic events except due to permanent ground deformation, or traveling ground-wave propagation greater than or equal to a Modified Mercalli Intensity of VIII (similar to a Richter scale magnitude around 6.8 to 7.0) (O'Rourke and Palmer, 1996; USGS, 2018a). The largest recorded earthquake within 50 miles of the Project had a magnitude of 3.0 with an epicenter approximately 46 miles from the Project in Virginia (USGS, 2019a).

4.1.4.2 Active Faults

The USGS maintains a Quaternary fault and fold database of the United States for any fault or fold with evidence of deformation in the past 1.6 million years (USGS, 2018b). Quaternary faults where there has been displacement in the last 10,000 years are considered to be active by the USGS (USGS, 2019b). The Project does not cross nor would any aboveground facility overlie any Quaternary faults (USGS, 2018b).

Regional faults are presented in table 4.1-1. The Project would be within 100 miles of seven USGS-recognized faults and fault zones. The USGS classifies these faults from A to C. Class A faults have geologic evidence that demonstrates tectonic origin either exposed by mapping or inferred from deformational features. The nearest Class A faults to the Project are within the Central Virginia Seismic Zone, 85 miles from the pipeline alignment.

TABLE 4.1-1

Faults and Fault Zones within 100 Miles of the Southgate Project

Fault or Zone Name	Class	Distance	Last Active Period/Era
Central Virginia Seismic Zone	A	85 miles	Quaternary (late Pleistocene) (15 ka)
Pembroke Fault	B	5-20 miles	Undifferentiated Quaternary (<1.6 ma)
Linside Fault Zone	C	1-10 miles	No Quaternary Movement Demonstrated
Lebanon Church Fault	C	85 miles	No Quaternary Movement Demonstrated
Old Hickory Faults	C	85 miles	No Quaternary Movement Demonstrated
Stanleytown Fault	C	25 miles	Unknown
Hares Crossroads faults	C	65 miles	Unknown

Sources: USGS, 2018b; Crone and Wheeler, 2000; Wheeler, 2006; Law et al, 1994.
ka = thousand years ago
ma = million years ago.

Class B faults have geologic evidence indicative of Quaternary deformation but the fault is not deep enough to be a potential source for earthquakes, or the evidence available is insufficient to assign a fault as either Class C or Class A (USGS, 2018b). There is one Class B fault, the Pembroke Fault, located 5 to 20 miles from the pipeline alignment. The evolution for this fault is thought to be dissolution of underlying carbonate bedrock or subsidence induced by collapse of subsurface karst, and not a seismic event (Crone and Wheeler, 2000; Wheeler, 2006).

Class C features are classified as having insufficient evidence to demonstrate the existence of tectonic origin, or slip and deformation. There are five Class C features between 1 and 85 miles from the pipeline alignment (see table 4.1-1).

Due to the relatively low seismic risk and the absence of active faults in the immediate Project vicinity, impacts from seismic activity are not anticipated to affect operation or construction of the Project. Furthermore, the Project facilities would be constructed per the International Building Code (IBC) 2012 (Chapter 16 and Section 1613), in accordance with federal standards for natural gas pipeline safety (49 CFR 192), and American Society of Civil Engineers (ASCE) 7-10, Minimum Design Loads for Buildings and Other Structures.

4.1.4.3 Soil Liquefaction

Soil liquefaction is a phenomenon often associated with seismic activity in which saturated, non-cohesive soils temporarily lose their strength and liquefy (i.e., behave like viscous liquid) when subjected to forces such as intense and prolonged ground shaking. Due to the low potential for a seismic event that would cause strong and prolonged ground shaking, the potential for soil liquefaction to occur is very low and we conclude the potential for soil liquefaction to impact Project facilities is negligible.

4.1.4.4 Landslides

Landslides are defined as the movement of rock, debris, or soil down a slope. Some landslides develop and move slowly and cause damage progressively over a period of many years. Some landslides move rapidly and can cause damage suddenly. Ground failure and slope failure (slips) are typically associated with steep slopes and may be initiated by precipitation, seismic activity, slope disturbance due to construction, or a change in groundwater conditions, such as a seasonal high groundwater table, and soil characteristics. Landslides could occur during the construction, operation, and maintenance of the Project. Construction factors that may increase the potential for slope failure include trenching along slopes and the burden of construction equipment on unstable surfaces.

An overview of landslide incidence and susceptibility was derived from USGS mapping (USGS, 2016b) and Light Imaging Detection and Ranging (LiDAR) data. The Project would cross 1.82 miles of slopes greater than 30 percent (see appendix C.3) based on Project-specific LiDAR data. In areas of steep slope or side slope construction, Mountain Valley would employ temporary sediment barriers such as reinforced silt fences and silt rock, which would be installed prior to any clearing activities on the right-of-way to prevent movement of sediment. To divert water to vegetated areas or reduce water runoff, Mountain Valley may install temporary slope breakers during grading activities per FERC's Plan and the Project-specific E&SC Plan. Additionally, Mountain Valley would install post-construction stormwater controls and permanent slope breakers as needed.

For slopes 32 percent or greater, as identified via LiDAR data, as well as for side slopes that may result in parallel or near parallel pipeline construction and areas of identified historic landslide, Mountain Valley completed additional field assessment and assigned site-specific control measures to these areas in their Landslide Mitigation Report[2]. Mountain Valley has proposed to implement mitigation and stabilization control measures including: trench breaker daylight drains, cutoff drains, transverse trench drains, rock lined swales, riprap natural drains,

[2] Mountain Valley's Landslide Mitigation Report was included as attachment 1-1 to the March 28, 2019 Supplemental Responses to the February 13, 2019 EIR. The Landslide Mitigation Report can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190329-5046 in the "Numbers: Accession Number" field.

riprap slope breakers, trench breaker pass-through drains, brow ditches, geogrid reinforcement, and highwall revetment, steep slope revetment and compact slope breakers. Appendix C.4 lists areas of potential landslide concern and proposed mitigation and/or stabilization control measures. Based on Mountain Valley's characterization of slopes in the Project area and proposed mitigation measures, we conclude that potential Project effects related to landslides would be adequately minimized.

4.1.4.5 Land Subsidence

Subsidence, involving the localized or regional lowering of the ground surface, may be caused by karst formation due to limestone or gypsum bedrock dissolution; sediment compaction due to groundwater pumping and/or oil and gas extraction; and underground mining. Oil and gas well production, underground mines, and large groundwater withdrawals do not occur in the Project area.

Karst features, such as sinkholes, caves, and caverns, can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone, marble, and dolostone). These features could present a hazard to the pipeline due to cave or sinkhole collapse. Because karst features provide a direct connection to groundwater, there exists the potential for pipeline construction to impact groundwater from increased turbidity due to runoff of sediment into karst features or from inadvertent spills of fuel or other hazardous materials from construction equipment (see section 4.3.1.7). Karst areas are also associated with seeps and springs, which could experience temporary changes in flow characteristics from construction of the pipeline. Seeps and springs along steep slopes could likewise contribute to and be the cause of landslides or other earth movements.

In the Piedmont province of Virginia, sinkholes occur in narrow marble belts (VADMME, 2015). Based on the Weary and Doctor (2014) 1:500,000-scale digital map of karst in the United States, portions of the Project alignment would cross a marble-containing (karst-susceptible) conglomerate unit.

Mountain Valley completed a Karst Hazard Assessment of potential karst features for the Project. During desktop assessment, Mountain Valley consulted 1:24,000-scale Virginia Division of Geology and Mineral Resources (VADGMR) geologic maps and identified five locations where the conglomerate unit would be crossed by the Project alignment (table 4.1-2). Pedestrian survey was completed within 150 feet of the proposed alignment at these five locations to further assess the environment for the presence of karst terrain. No karst features were identified. Based on this assessment, subsidence hazards from karst terrain are not anticipated to impact the Project during construction or operation.

If karst features are observed during construction, Mountain Valley would employ a karst specialist to conduct a field investigation to inspect and characterize the karst features and potential for subsurface connectivity. The karst specialist would coordinate with the Project geologist to conduct the field inspection and would notify the applicable agencies regarding the karst feature. If the karst feature is determined to have subsurface connectivity and present a potential hazard to pipeline construction and operation, or be a potential conduit to local groundwater resources, appropriate mitigation measures would be identified by a karst specialist, and would be discussed with the applicable agencies prior to implementation.

TABLE 4.1-2

Locations of Field Surveys of Conglomerate Rock that may Represent Karst Terrain near the Southgate Project

State	County	From Milepost	To Milepost	Crossing Length	Rock Type	Construction Method
Virginia	Pittsylvania	0.03	1.0	3,696	Conglomerate (covered by terrace deposits)	Open-cut and bore (road crossings)
Virginia	Pittsylvania	14.95	15.70	3,960	Conglomerate	Open-cut and bore (road crossings)
Virginia	Pittsylvania	21.20	21.50	1,584	Conglomerate	Open-cut and bore (road crossings)
Virginia	Pittsylvania	21.80	21.91	581	Conglomerate	Open-cut and bore (road crossings)
Virginia	Pittsylvania	22.12	22.30	950	Conglomerate	Open-cut and bore (road crossings)

Sources: Henika, 1983; Marr, 1984. Price et al, 1980.

4.1.4.6 Shallow Bedrock and Blasting

Areas with shallow bedrock (bedrock within 60 inches of the ground surface) were identified using the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA NRCS, 2018a). The Project pipeline route would traverse approximately 5.3 miles (153.1 acres) of shallow bedrock. Areas of shallow bedrock are listed in detail by milepost in appendix C.5. The potential for blasting exists at all locations where shallow bedrock may be encountered. Blasting may also be required at the Lambert Interconnect and MLV 1 as well as at the LN 3600 Interconnect due to slope and depth to bedrock at both locations.

If unrippable bedrock is encountered, Mountain Valley would first attempt trenching with rock trenching machines, rock saws, hydraulic rams, and jack hammers. If blasting becomes 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. Any required blasting would be conducted in accordance with all federal, state, and local regulations.

Mountain Valley has identified slopes along the pipeline alignment that may require blasting during the construction process (see appendix C.5). The use of blasting along slopes has the potential to increase the risk of landslides during pipeline construction. Blasting conducted in these areas would be confined to the right-of-way alignment during trench excavation. Blasting would only be used as needed to fracture rock allowing for conventional excavation to occur. Furthermore, explosives used for blasting in these areas would be managed for weight, powder factor, type of explosive and delays implemented to be adjusted for the management of peak particle, longitudinal, vertical and transverse velocities for the reduction in transferred energy to surrounding slopes allowing for the mitigation of potential slope movement.

In order to minimize potential impacts from blasting, Mountain Valley would comply with all federal, state, and local regulations for blasting. Mountain Valley filed a *General Blasting Plan*[3] that describes the measures and BMPs it would implement during construction to reduce and mitigate impacts from blasting. As outlined in the *General Blasting Plan*, Mountain Valley would:

- limit the charge size;
- use heavy mats or other suitable cover to prevent the scattering of debris;
- use seismograph equipment to monitor the velocity of the blasts at select monitoring locations including closest adjacent facilities;
- conduct pre-and post-blast testing and inspections of water wells and structures within 150 feet of blasting area;
- man valves at adjacent pipelines in case of an emergency arising from nearby blasting activities;
- provide verbal and written notification of residents and owners of structures within 150 feet of blasting activities before blasting activities would begin;
- use warning signals, flags, and barricades;
- conduct pre-blast and post-blast surveys at locations within 150 feet of the blasting activity; and
- use excess rock from blasting to restore the right-of-way, placed as per landowner agreements, or hauled off-site to an approved disposal site.

In addition, Mountain Valley's *General Blasting Plan* requires the blasting contractor to prepare Project/site-specific blasting plan(s) for approval by Mountain Valley prior to the use of any explosives. Mountain Valley would investigate damage claims associated with blasting and would repair or mitigate damage through agreements with landowners. Refer to section 4.3.1 for a discussion of blasting impacts and mitigation measures for drinking water supplies.

4.1.4.7 Flooding

Flash flooding occurs when there is rapid and substantial increases in water flow rate and water volume within waterbodies or onto adjacent floodplains. Flash flooding can occur after excessive or significant rainfall over a short period of time (less than 6 hours). The occurrence of flash flooding can be within minutes or hours of significant rainfall and is dependent on the size

[3] Mountain Valley's *General Blasting Plan* was included as attachment 103-1 to Mountain Valley's March 5, 2019 response to the February 13, 2019 FERC Environmental Information Request (EIR). The *General Blasting Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190305-5214 in the "Numbers: Accession Number" field.

of the contributing watershed after dam or levee failure, and/or the duration of the rain event (NWS, 2010). The National Weather Service (NWS) Flash Flood Guidance estimates that the amount of rainfall needed to generate flash flooding in the counties crossed by the Project is 1.5 to 2.0 inches per hour (National Oceanic and Atmospheric Administration, 2019).

Seasonal and flash flooding hazards are a potential concern where facilities would cross or be near 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. Flooding can also affect the pipeline by increasing buoyancy, causing the pipe to rise toward the land surface where it may become exposed. Mountain Valley would implement mitigation measures per its Procedures and the Project E&SC Plan, as needed, within floodplains to minimize potential impacts from flood events. These measures may include:

- using concrete coating, gravel-filled blankets, or concrete weights on the pipeline to maintain negative buoyancy; and
- restoring floodplain contours and waterbody banks to their pre-construction condition so that there is no net loss of flood storage capacity.

Given that Mountain Valley would implement measures to prevent or minimize pipeline buoyancy and to restore floodplain contours after completion of construction, we conclude that adverse impacts from flood hazards would be minor during construction and operation of the Project. Refer to section 4.03 for further discussion on floodplain storage.

4.1.4.8 Uranium

The closest economically viable uranium deposit to the Project is at Coles Hill in Pittsylvania County, Virginia, 3.5 miles north of the Lambert Compressor Station (Coles Hill, LLC). This deposit is exposed locally within Coles Hill and proceeds to dip and extend underground (RTII, 2012). No encounters with the Coles Hill deposit are anticipated as a result of Project-required excavation due to the deposit depth and distance from the Project.

Uranium mobilization in the environment can occur through the exposure of uranium-containing rocks and sediments to the weathering process (physical or chemical), causing uranium to be released from its parent material. Redistribution can further occur via activities and processes that move soil and rock. Therefore, background concentrations of uranium in soils, sediments, shallow bedrock, and groundwater were assessed via a review of publicly available information.

The USGS National Uranium Resource Evaluation (NURE) database contains the results of sediment and water sampling completed under the NURE program from approximately 1975 through 1984. Within 0.5 mile of the Project workspace in Virginia, NURE analyzed 16 sediment samples and 11 groundwater samples[4] for uranium (USGS, 2004). The average concentration of uranium in these groundwater samples was 0.09 micrograms per liter (µg/L) and the highest concentration was 0.388 µg/L; the average uranium concentration in the 16 sediment samples was 8.07 milligrams per kilogram (mg/kg) and the highest uranium concentration was 13.6 mg/kg. The

[4] Of the groundwater samples collected, 10 were collected from wells with reported depths ranging from 44 feet to 165 feet and a single sample was collected from a source labeled as a spring.

EPA primary drinking water standard (maximum contaminant level [MCL] - the maximum level allowed of a contaminant in water which is delivered to any user of a public water system) for uranium is 30 µg/L. Based on NURE sampling results, uranium concentrations in groundwater near the Project are significantly lower than the EPA MCL.

Uranium has an average concentration in U.S. soils of about 3 mg/kg (U.S. Department of Health and Human Services [U.S. DHHS], 2013). Based on a review of USGS soil geochemistry data (4,857 sites in the conterminous U.S.), uranium concentrations near the Project in Virginia are approximately 2.0 to 2.2 mg/kg for a depth of 0 to 5 cm (50 to 60th percentile), 1.5 to 1.8 mg/kg for the A horizon (30 to 40th percentile), and 2.1 to 2.4 mg/kg for the C horizon (50 to 60th percentile) (Smith et. al., 2014). This is generally consistent with NURE aeroradiometric data (airborne gamma-ray spectrometry), which estimated concentrations of uranium in shallow bedrock and soils (top few centimeters) in Pittsylvania County to range from approximately 1.0 mg/kg to approximately 2.6 mg/kg.

The mobility of uranium in soil and its vertical transport (leaching) to groundwater depend on soil properties such as pH, oxidation-reduction potential, concentration of complexing anions, porosity of the soil, soil particle size, and sorption properties, as well as the amount of water available (U.S. DHHS, 2013). The transport and dispersion of uranium in surface water and groundwater are affected by adsorption and desorption of the uranium on surface water sediments. In most waters, sediments act as a sink for uranium and the uranium concentrations in sediments and suspended solids are several orders of magnitude higher than in surrounding water (U.S. DHHS, 2013). In anoxic waters (reductive environment), soluble U(VI) is reduced to U(IV) and deposited into the sediment (U.S. DHHS, 2013). Uranium can also be removed from solution by physical adsorption processes, such as adsorption onto oxides of iron or manganese that occur as coatings on the particles of soil and sediment (U.S. DHHS, 2013). This process is reflected in the higher concentrations of uranium present in the NURE sediment data described above.

The sorption of uranium in most soils is such that it may not leach readily from soil surface to groundwater, particularly in soils containing clay and iron oxide although other geological materials such as silica, shale, and granite have poor sorption characteristics (U.S. DHHS, 2013). Uranium is therefore transported poorly from soils to plants; the uptake of uranium by plants is dependent on levels of available (soluble) uranium. Particulate uranium represents an inhalation source for humans, dependent upon concentration and particle size. For particulate uranium to be an inhalation hazard to humans, the particulates must be in the size range of 1–10 µm (U.S. DHHS, 2013).

Based on the above assessment, concentrations of uranium in sediment, soils, shallow bedrock, and groundwater near the Project workspace in Pittsylvania County are comparable to concentrations in environmental media in the conterminous United States. Uranium is generally not highly mobile in the environment, and Mountain Valley would implement their E&SC Plan to address fugitive dust mitigation, stormwater control, and erosion and sediment control measures during ground disturbance activities, which would reduce the mobilization of uranium during Project construction. Therefore, significant impacts on human health and the environment are not anticipated during construction and operation of the Project.

4.1.4.9 HDD Feasibility and Geotechnical Investigations

Mountain Valley has proposed the use of the HDD method to cross sensitive resources at two separate locations (Dan River and Stony Creek Reservoir). Length of an HDD alignment, pipeline diameter, and subsurface material are factors in the technical feasibility of an HDD installation. Subsurface conditions that can affect feasibility of an HDD installation include excessive rock strength and abrasiveness, unconsolidated gravel and boulder materials, poor bedrock quality, solution cavities, and artesian conditions. It is also possible for HDD pipeline installation operations to fail, primarily due to encountering unexpected geologic conditions such as transitioning from coarse unconsolidated materials into bedrock or if the pipe were to become lodged in the hole during pullback operations.

During HDD operations, drilling fluid consisting primarily of water and bentonite clay is pumped under pressure through the inside of the drill pipe and flows back (returns) to the drill entry point along an annular space between the outside of the drill pipe and the drilled hole. Because the drilling fluid is pressurized, in certain conditions it can seep into the surrounding rocks and sediment. Formational drilling fluid losses typically occur when the drilling fluid flows through pore spaces in soil or within fractures in rock formations. Inadvertent returns (IRs) of drilling fluid to the ground surface are more likely to occur in less permeable soils or via fractures or fissures in bedrock. Chances for an IR to occur are greatest near the drill entry and exit points where the drill path has the least amount of ground cover. This can be caused by low soil shear strength and pre-existing fractures in the bedrock formations. A summary of geotechnical investigations and feasibility assessments completed for each proposed crossing follows.

Dan River

The total crossing length of Mountain Valley's proposed Dan River HDD would be 2,523 feet. Mountain Valley completed two geotechnical borings along the proposed alignment to depths of 175 to 176 feet below the ground surface (bgs). Overburden material was found to be sands, silts, and clays; bedrock was encountered at a depth of 35 to 37 feet bgs and consisted primarily of sandstone and siltstone that extended to the terminal depth of each boring. A proposed depth of cover of 45 bgs would be maintained between the Dan River bed and the proposed alignment. At this depth, the drill path would be within bedrock. Based on available analysis, a majority of the drill path would be within competent bedrock with high rock quality designation values (greater than 50 percent). Mountain Valley's geotechnical contractor determined that the current HDD design is feasible; however, additional geotechnical borings are planned to confirm the findings.

A hydrofracture risk assessment determined that there would be an elevated risk of IR near the exit point of the drill. Mountain Valley proposes to expand its mud-receiving pit to include the area with elevated IR potential. Mountain Valley plans to conduct additional hydrofracture analysis for the HDD crossing to confirm its design.

Stony Creek Reservoir

The total crossing length of Mountain Valley's proposed Stony Creek Reservoir HDD would be 1,619 feet. Mountain Valley completed one geotechnical boring along the proposed alignment to a depth of 180 feet bgs. Overburden material was found to be sands, silts, and clays; bedrock was encountered at a depth of 18.9 feet bgs and consisted primarily of gray sandstone, white quartzite, and gray schist. A proposed depth of cover of 50 to 55 feet bgs would be maintained between the Stony Creek Reservoir and the proposed alignment. At this depth, the drill would be within bedrock. Based on available analysis, a majority of the drill path would be within competent bedrock with high rock quality designation values (greater than 50 percent). Mountain Valley's geotechnical contractor determined that the current HDD design is feasible; however, Mountain Valley plans to conduct additional geotechnical borings to confirm its findings.

A hydrofracture risk assessment determined that there would be an elevated risk of IR near the exit point of drill for the Stony Creek Reservoir HDD crossing. Mountain Valley proposes to expand its mud-receiving pit to include the area with elevated IR potential. Mountain Valley plans to conduct additional hydrofracture analysis for the HDD crossing to confirm its design.

Access issues limited collection of geotechnical information at the Stony Creek Reservoir crossing location. If the Project is approved, prior to construction of the Stony Creek Reservoir HDD, Mountain Valley would complete one additional geotechnical boring to further confirm its feasibility determination and hydrofracture assessment and would provide an updated geotechnical report to the FERC. To ensure our analysis includes the most up to date information on the Dan River and Stony Creek HDD crossings, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Mountain Valley should file with the Secretary all outstanding geotechnical studies for the proposed Dan River and Stony Creek Reservoir HDD crossings, revised feasibility and hydrofracture analyses, and any proposed mitigation following completion of these studies.**

HDD General Impacts and Mitigation

Drilling fluids associated with HDD operations would consist primarily of water and bentonite clay. Mountain Valley would require approval from FERC staff for the use of any additional proposed additives, and all additives would comply with applicable permit requirements. Mountain Valley's *HDD Contingency Plan*[5] specifies the use of instrumentation to monitor drilling fluid pressure and discharge rate, torsional pressure, and annular pressure during pilot hole drilling. Spill kits would be stored on-site, and a vacuum truck would be present prior to and during drilling operations to respond to any potential IR. In addition, containment materials, including straw, fabric filter fence, sand bags and boom and turbidity curtains, would be positioned on-site for immediate use, if necessary. Sediment barriers would also be constructed around the drill entry and exit pits. The *HDD Contingency Plan* requires that regular pedestrian surveys be completed on the land-based sections of drill alignments during drilling operations to facilitate rapid identification and response to an IR. Mountain Valley's *HDD Contingency Plan* would

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5 Mountain Valley's *Horizontal Directional Drill Contingency Plan* was included as attachment 36-1 to Mountain Valley's March 5, 2019 response to the February 13, 2019 FERC EIR. The *Horizontal Directional Drill Contingency Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190305-5214 in the "Numbers: Accession Number" field.

ensure that drill operations are monitored and adjusted to avoid potential IRs, and if one should occur, that the release would be contained to the extent practicable and remediated. We have reviewed Mountain Valley's *HDD Contingency Plan* and find it acceptable.

Based on the above analyses, we conclude that subsurface conditions identified by the geotechnical studies would not render the HDDs infeasible. With consideration of the adopted mitigation measures, and Mountain Valley's commitment to complete additional geotechnical investigation at the Stony Creek crossing location, we conclude that potential impacts from HDD construction and potential IRs would not be significant.

4.1.5 Geology Conclusions

The Project would traverse a range of geologic conditions and resources. We conclude that construction and operation of the Project facilities in accordance with Mountain Valley's specific *Unanticipated Discovery Plan for Paleontological Resources* and other Project plans would not result in a significant impact on mines, mineral resources, or paleontological resources.

Mountain Valley would reduce the potential for impacts from landslides by following the measures outlined in its Landslide Mitigation Report. In addition, with the implementation of the measures outlined in Mountain Valley's *General Blasting Plan*, *HDD Contingency Plan*, E&SC Plan, and *Karst Hazard Assessment*, we conclude that impacts on geological resources would be adequately minimized.

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4.2 SOILS

The soils crossed by the Project were identified and assessed using various data sources including the publicly available Web Soil Survey database. The Web Soil Survey database is a digital version of the original county soil surveys developed by the USDA NRCS (USDA, 2018a). It provides the most detailed level of desktop soils information for general natural resource planning and management. However, it should be noted that the minimum delineation size for many soil surveys is about 1.5 acres, which is over 600 feet of the Project's right-of-way. The Web Soil Survey database provides the proportionate extent of the component soils and their properties for each soil map unit, allowing for an evaluation of potential hazards and soil limitations along the Project. Appendix D identifies by milepost the specific soil units that would be crossed by the Project.

Construction of the Project facilities would temporarily and permanently disturb soils, resulting in increased potential for erosion, compaction, and reduced vegetation following construction. The potential for soil erosion would be minimized through the use of erosion controls and revegetation measures as described in FERC's Plan and Mountain Valley's E&SC Plan.

4.2.1 Soil Limitations

Several soil characteristics have the potential to affect or be affected by construction and operation of the Project. These soil limitations include erosion potential, farmland classification, compaction prone soils, rocky soils/shallow depth to bedrock, and poor revegetation potential. Table 4.2-1 lists soil limitations for the Project.

4.2.2 Erosion Potential

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the erosion process. Soils most susceptible to erosion by water are typified by bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well-vegetated, and have high infiltration capacity and internal permeability. Wind erosion processes are less affected by slope angles than water erosion processes. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent.

Soils were considered to be prone to water erosion if soils were ranked as having a "K factor" of 0.4 (Moderate erosion classification) or greater. The K factor is a quantitative representation of the potential for bare soil to undergo particle detachment and transportation via water. Soils are considered to be prone to wind erosion if they are in wind erodibility groups (WEG) 1 or 2 (USDA, 2018a). The WEG is a quantitative measure for susceptibility to wind erosion based on soil layers, soil moisture, and plant growth as contributing factors.

Construction of the Project would disturb about 35.1 acres of soils classified as being highly erodible by water. None of the soils that would be disturbed by construction of the Project are highly prone to erosion by wind; however construction activities such as clearing, grading, and equipment movement can nonetheless accelerate the erosion process.

TABLE 4.2-1

Summary of Soil Characteristics and Limitations for the Southgate Project

Facility / County, State	Area of Project Workspace Within Designated Soil Classification / Limitation (Acres)						
	Prime Farmland or Farmland of Statewide Importance a/	Compaction Prone b/	Highly Water Erodible c/	Highly Wind Erodible d/	Shallow Depth to Bedrock e/	Low Revegetation Potential f/	Stony / Rocky g/
H-605 Pipeline							
Pittsylvania, Virginia	7.7	0.0	0.0	0.0	0.0	0.0	0.0
H-650 Pipeline							
Pittsylvania, Virginia	354.6	2.6	9.3	0.0	19.6	19.6	19.6
Rockingham, North Carolina	258.6	2.1	16.8	0.0	61.2	0.0	0.0
Alamance, North Carolina	267	9.2	0.0	0.0	8.7	0.0	0.0
Cathodic Protection Groundbeds							
Pittsylvania, Virginia	3.5	0.0	0.0	0.0	0.0	0.0	0.0
Rockingham, North Carolina	<0.1	0.0	0.0	0.0	0.0	0.0	0.0
Alamance, North Carolina	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Aboveground Facilities							
Pittsylvania, Virginia							
Lambert Compressor Station / Interconnect / MLV 1 (MP 0.0)	19.0	0.0	0.0	0.0	0.0	0.0	0.0
MLV 2 and 3 (MPs 7.4 and 18.3)	0	0.0	0.0	0.0	0.0	0.0	0.0
Contractor Yards	98.9	0.0	0.0	0.0	0.0	4.2	0.0
Access Roads	132.7	0.0	0.3	0.0	0.7	0.6	0.7
Rockingham, North Carolina							
LN 3600 Interconnect (MP 28.2)	4.7	0.0	0.0	0.0	0.0	0.0	0.0
T-15 Dan River Interconnect / MLV 4 (MP 30.4)	5.1	0.0	0.1	0.0	0.0	0.0	0.0
MLV 5 (MP 42.2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 4.2-1

Summary of Soil Characteristics and Limitations for the Southgate Project

Facility / County, State	Prime Farmland or Farmland of Statewide Importance a/	Compaction Prone b/	Highly Water Erodible c/	Highly Wind Erodible d/	Shallow Depth to Bedrock e/	Low Revegetation Potential f/	Stony / Rocky g/
	Area of Project Workspace Within Designated Soil Classification / Limitation (Acres)						
Contractor Yards	0.0	11.9	7.8	0.0	11.9	0.0	19.7
Alamance County, North Carolina							
MLVs 6 and 7 (MPs 55.1 and 68.2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T-21 Haw River Interconnect / MLV 8 (MP 73.1)	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Contractor Yards	22.3	0.0	0.0	0.0	10.4	0.0	0.0
Access Roads	18.1	0.0	0.0	0.0	0.2	0.3	0.0
Guilford County, North Carolina							
Access Roads	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Caswell County, North Carolina							
Contractor Yard	75.5	0.0	0.0	0.0	35.3	0.0	0.0
Project Total	**1,300.1**	**25.8**	**35.1**	**0**	**153.1**	**24.6**	**40.0**
Percent of Project Area h/	**87.6**	**1.7**	**2.4**	**0**	**10.3**	**1.7**	**2.7**

Note: Pig launchers and receivers and Mainline Valves (MLVs) 1, 4, and 8 would be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect); therefore, acreages calculations for the pig launchers and receivers and MLVs are included with those facilities.

a/ Prime farmland includes soils designated by the USDA NRCS as drained and / or reclaimed of excess salts and sodium. No areas of unique farmland or farmland of local importance would be affected by the Project (USDA, 2018b).

b/ Soils with clay loam or finer texture and a drainage class of poor, somewhat poor, or very poor.

c/ Soils with a K factor that is greater than 0.4.

d/ Soils in wind erodibility groups 1 or 2.

e/ Soils that have a depth to bedrock of less than 5 feet (60 inches).

f/ Soils with an average low rating based on factors including but not limited to: drainage class of excessively drained or very poorly drained; K Factor greater than 0.4; and slope greater than 25 percent

g/ Soils with a cobbly, stony, bouldery, shaly, channery, 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/ Totals do not equal 100 percent as not all soils are classified with limitations and certain soils are classified as having multiple limitations.

To minimize soil erosion, the Project would follow BMPs included in Mountain Valley's E&SC Plan. These BMPs may include, but are not limited to:

- installation of slope breakers and trench breakers;
- installation of sediment barriers, such as silt fence and hay bales;
- restoration of soil layering;
- restoration of surface contours; and
- stabilization of disturbed work areas with permanent seeding within seven working days of final grade, weather and soil conditions permitting.

Temporary erosion control devices (ECDs) would be installed immediately following soil disturbance. ECDs would be inspected regularly and would only be removed following the successful revegetation of an affected area. Mountain Valley would also employ permanent ECDs such as trench breakers (at the base of slopes greater than 5 percent and within 50 feet of waterbodies or wetlands) and slope breakers (in all areas except for cultivated lands).

In addition, Mountain Valley would implement dust suppression measures, including watering construction areas to reach optimum soil moisture for dust control, thus reducing soil loss due to wind erosion.

4.2.3 Prime Farmland

The USDA (2018b) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops." Developed 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 unique farmland and farmland of statewide or local importance. Unique farmland is land that is used for production of specific high-value food and fiber crops. Soils may be considered of statewide or local importance if those soils are capable of producing a high yield of crops when managed according to accepted farming methods.

Construction of the Project would disturb approximately 1,300.1 acres of prime farmland and farmland of statewide importance, of which 186.1 acres are currently in agricultural use (refer to table 4.2-2).

TABLE 4.2-2

Prime Farmland Affected by the Southgate Project

	Area of Project Workspace within Prime Farmland Areas (Acres) a/							
	Mapped Prime Farmland b/		Prime Farmland Currently in Agricultural Use c/		Mapped Farmland of Statewide Importance d/		Farmland of Statewide Importance Currently in Agricultural Use e/	
Facility	Const f/	Oper g/	Const	Oper	Const	Oper	Const	Oper
H-605 Pipeline	6.3	2.3	1	0.6	1.4	0.5	0	0
H-650 Pipeline	378.5	140.7	94.7	31.1	491.7	189.7	64.9	25
Cathodic Protection Groundbeds	2.1	2.1	0	0	2	2	0	0
Aboveground Facilities	25.3	10.3	12.2	6.1	5	3.6	0.5	0.2
Contractor Yards	106.7	0	0	0	89.8	0	0	0
Access Roads	44.2	4.5	8.5	0.7	38.2	1.6	4.3	0.1
Project Total h/	**563.1**	**159.9**	**116.4**	**38.5**	**628.1**	**197.4**	**69.7**	**25.3**

Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect); therefore, acreage calculations for the pig launchers and receivers are included with those facilities. MLVs 1, 4, and 8 will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect); therefore, acreage calculations for these MLVs are included with those facilities.

a/ No areas of farmland of local importance or unique farmland would be affected by the Project.

b/ Prime farmland includes soils mapped and designated as prime farmland by the NRCS if drained and/or irrigated and/or reclaimed of excess salts and sodium.

c/ Agricultural land (i.e., cultivated land) within areas identified as prime farmland. Numbers represent actual land in agricultural use.

d/ Farmland of statewide importance is mapped by Web Soil Survey and determined by the appropriate state agencies which may include areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

e/ Agricultural land (i.e., cultivated land) within areas identified as farmland of statewide importance. Numbers represent actual land in agricultural use.

f/ Construction acres include the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between HDD entry and exit points and railroad rights-of-way are not included in this acreage.

g/ Includes only the operational footprint of the Project facilities and the 50-foot-wide permanent pipeline right-of-way.

h/ Sums may not equal addends due to rounding. Addends consist of six-decimal digits.

Permanent impacts on prime farmland and farmland of statewide importance would be limited to soils within the footprint of new aboveground facilities (approximately 13.9 acres total) and new permanent access roads (6.1 acres total), where soils would be permanently converted to industrial use. These impacts represent less than 0.01 percent of available prime farmland and farmland of statewide importance in Pittsylvania, Rockingham, and Alamance Counties.[6]

6 Mapped prime farmland and farmland of statewide importance totals 515,021 acres in Pittsylvania County; 253,584 acres in Rockingham County; and 232,316 acres in Alamance County (USDA NRCS, 2018b).

Agricultural activities would not be precluded within the permanent pipeline right-of-way; therefore, impacts on prime farmland and farmland of statewide importance within temporary work areas would be limited to the construction phase. Within these areas, impacts on prime farmland would be minimized by implementing BMPs based on FERC's Plan. These include measures to conserve and segregate the upper 12 inches of topsoil, alleviate soil compaction, protect and maintain existing drainage tile and irrigation systems, prevent the introduction of weeds, and retain existing soil productivity, thereby minimizing the potential for long-term impacts on agricultural lands.

4.2.4 Compaction Prone Soils

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils; the degree of potential compaction was evaluated based on soil texture and drainage class. Compaction is typically of concern when the moisture content of the soils is high such as in hydric soils or during precipitation events.

Impacts on compaction prone soils would be minimized by limiting construction traffic along the right-of-way. Mountain Valley would also decompact all heavily disturbed areas by tilling. Mountain Valley would conduct topsoil and subsoil compaction tests using a penetrometer or other appropriate device at regular intervals in agricultural and residential areas, and elsewhere at the discretion of the EI in areas of heavy compaction. If additional decompaction of the area is required, additional mechanical methods (i.e. deep tilling) would be used following consultation with the landowner and state agencies based on desired land use.

4.2.5 Rocky Soils/Shallow Depth to Bedrock

Soils with textural classifications of cobbly, stony, bouldery, shaly, channery, very gravelly, or extremely gravelly in any layer; or that have a surface layer that contains greater than 5 percent by weight rock fragments larger than 3 inches, may be characterized as stony or rocky soils. Typically, stony/rocky soils do not hold water well and exhibit a low revegetation potential due to low water content and higher seed mortality. Additionally, in areas with shallow bedrock (bedrock within 5 feet of the ground surface), there is increased potential to introduce rocks into the topsoil during construction activities.

Construction of the Project, including the right-of-way, ATWS, access roads, and contractor yards would affect about 40.0 acres of soils considered to be stony/rocky and 153.1 acres of shallow bedrock. Aboveground facilities associated with the Project would not affect stony/rocky or shallow to bedrock soils.

The strength and hardness of shallow bedrock encountered during pipeline construction activities would dictate the techniques used for excavation. Mechanical means, such as ripping or conventional excavation would be prioritized for removal of bedrock prior to any bedrock blasting. However, it is anticipated that blasting may be required in some areas, as detailed in section 4.1.4.6.

Mountain Valley would remove excess rock from topsoil, consistent with FERC's Plan, in all disturbed cultivated and rotated croplands, hayfields, and pastures. The trench may be backfilled with excavated rock material only to the height of the existing bedrock horizon.

Otherwise, excess rock would be disposed at an approved site unless the landowner or land managing agency approves an alternative beneficial reuse.

4.2.6 Poor Revegetation Potential

The revegetation potential of soils is based on the surface texture, drainage class, slope, and erosion potential. The clearing and grading of soils with poor revegetation potential could result in a lack of adequate vegetation following construction and restoration of the right-of-way, which could lead to increased erosion, a reduction in wildlife habitat, and adverse visual impacts.

Construction of the Project, including the right-of-way, ATWS, access roads, and contractor yards would affect about 24.6 acres of soils classified as having poor revegetation potential. Aboveground facilities would not affect any soils with poor revegetation potential.

In order to minimize and mitigate potential impacts on soils with poor revegetation potential, Mountain Valley would follow measures in accordance with FERC's Plan, such as:

- reseeding would be based on seed mix and rate information received for each county from the local NRCS and State Conservation Districts;
- site-specific soil pH modifiers and fertilizers, as required by landowners or regulatory agencies, would be incorporated into the top 2 inches of soil as soon as practicable;
- standard soil amendments (i.e. lime, fertilizer) would be applied in areas of low revegetation potential where no site-specific requirements are identified, to enhance plant establishment and offset potential nutrient loss;
- specific plant composition for revegetation (i.e. cover crops) requests from landowners would be replanted with those specified species; and
- conducting follow-up inspections to determine the success of revegetation and address landowner concerns and development of a corrective action plan for areas that are not responding to revegetation.

Section 2.0 of this draft EIS provides additional information regarding inspections, and seed mixes are discussed in section 4.4.

4.2.7 Contaminated Soils

A search of federal and state regulatory databases was conducted and 30 sites of potential contamination concern within 0.25 mile of the Project area were identified. However, the nearest site with an active or unresolved status is more than 400 feet from the proposed Project workspaces[7]. Based on distance from the proposed construction work area and regulatory status,

[7] The list of hazardous sites within 0.25 mile of the Project was included as part of Resource Report 8 in its November 6, 2018 application. The application can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

the Project is not anticipated to be affected by any identified sites. Further discussion of potential contaminated sites is provided in section 4.3.1.

Should contamination be discovered during construction, Mountain Valley would notify the affected landowner, coordinate with the appropriate agencies, and follow the procedures put forth in its *Unanticipated Discovery of Contamination Plan*. We have reviewed this plan and find it acceptable. Mountain Valley's *Unanticipated Discovery of Contamination Plan* provides seven stages of response should contamination be discovered during construction:

- Stage 1 – suspend all work activities and movement of personnel to a safe area;
- Stage 2 – identify immediate threats, notify emergency response, and evacuate as necessary;
- Stage 3 – if safety permits, secure the contaminated area with fencing or flagging and provide site personnel to restrict access as needed;
- Stage 4 – the contractor would notify Mountain Valley and the VADEQ or NCDEQ as appropriate;
- Stage 5 – document the discovery;
- Stage 6 – take remedial action including sampling, remedial action determination, remedial action implementation, and disposal; and
- Stage 7 – records of the unanticipated discovery disposal would be kept in accordance with record keeping requirements.

4.2.8 Soils Conclusions

Construction and operation of the Project would convert about 20 acres of prime farmland and farmland of statewide importance to industrial/commercial use. This constitutes a permanent, but minor impact due to the availability of prime farmland and farmland of statewide importance in the vicinity of the Project.

Mountain Valley would implement FERC's Plan and its E&SC Plan, SPCC Plan, and *Unanticipated Discovery of Contamination Plan* to minimize Project impacts on soils. These measures would include inspection during construction, installation and maintenance of ECDs, spill prevention and cleanup measures, topsoil segregation in agricultural and residential areas, soil compaction mitigation, and revegetation of temporary workspaces and the permanent pipeline right-of-way.

Based on the overall soil conditions present in the Project area and the Project's proposed construction and operation methods, we conclude that construction of the Project would not significantly alter the soils of the region**.**

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Aquifers

The Project is within the Piedmont physiographic province (USGS, 2000). The Project would cross the Early Mesozoic Basin and Piedmont Crystalline-Rock aquifer systems in Virginia and North Carolina (see table 4.3-1). Each aquifer system crossed by the Project is described below. Unconsolidated surficial aquifers consisting primarily of reworked Pleistocene-age glacial sediments and Holocene-age alluvium also overlie both aquifer systems but are discontinuous in extent and character. These surficial aquifers are not commonly used as potable water sources in the Project area but are generally suitable for municipal purposes. North Carolina and Virginia do not have state level aquifer designations or regulations. The Project would not cross any sole source aquifers or principal source aquifer areas.

TABLE 4.3-1

Aquifers Crossed by the Southgate Project

Project/State/ County	Nearest Project MPs	Major Aquifer System Name	Dominant Lithology	Well Yields (gpm)
Virginia				
H-605 Pipeline				
Pittsylvania	0.0 to 0.5	Early Mesozoic Basin aquifers	Sandstone aquifers	3-600 (Highly variable)
H-650 Pipeline				
Pittsylvania	0.0 to 4.4	Early Mesozoic Basin aquifers	Sandstone aquifers	3-600 (Highly variable)
	4.4 to 4.6	Piedmont Crystalline-Rock aquifers	Igneous and metamorphic rock aquifers	3-600 (Highly variable)
	4.6 to 26.1	Early Mesozoic Basin aquifers	Sandstone aquifers	3-600 (Highly variable)
North Carolina				
H-650 Pipeline				
Rockingham	26.1 to 32.6	Early Mesozoic Basin aquifers	Sandstone aquifers	3-600 (Highly variable)
	32.5 to 52.7	Piedmont Crystalline-Rock aquifers	Sandstone aquifers	3-600 (Highly variable)
Alamance	52.7 to 73.2	Piedmont Crystalline-Rock aquifers	Sandstone aquifers	3-600 (Highly variable)

Source: USGS, 2000
gpm=gallons per minute

Piedmont Crystalline-Rock Aquifer System

The Piedmont Crystalline-Rock aquifer system is the most common and widespread aquifer in the region (USGS, 2000). This aquifer system is generally comprised of crystalline metamorphic and igneous rock types, including coarse-grained gneiss and schist; however, fine-grained rocks such as phyllite, and metamorphosed volcanic rock such as volcanic tuff, ash, and lava flows are also common. Unconsolidated saprolite, colluvium, alluvium, and soil overlie the bedrock in most areas. The most significant water supplies in this aquifer system are found within a few hundred feet of the surface. Generally, the water is suitable for drinking; however, iron, manganese, and sulfate can occur locally in elevated concentrations.

Early Mesozoic Basin Aquifer System

The Early Mesozoic Basin aquifer system composes a small portion of the aquifers in the region (USGS, 2000); the Project is in the Dan River-Danville Basin aquifer area. The sedimentary rocks of the early Mesozoic systems generally had considerable effective porosity between grains but due to compaction and cementation, only a small part of the groundwater now flows between pores. Groundwater primarily moves along joints, fractures, and bedding planes. Aquifers in the Early Mesozoic Basin generally yield more water than other non-carbonated aquifers in the Piedmont province and are generally suitable for drinking.

4.3.1.2 Water Supply Wells and Springs

Published, recent data on springs in Virginia and North Carolina are not currently available. Information on public water supply wells was obtained from the EPA's Safe Drinking Water Information System (SDWIS) (EPA, 2016a). Digital location information for public water supplies was obtained from the VADEQ and the NCDEQ. Based on surveys completed at this time, there are no public water supply wells or springs within 150 feet of the Project. Based on current information there are 26 private wells within 150 feet of the Project which have undetermined use. Landowner surveys by Mountain Valley to identify any private wells and springs that are used for potable water on affected properties are ongoing. Therefore, **we recommend that**:

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, the locations of all private water wells and springs identified within 150 feet of the Project work areas, including the well's or springs' status, use, distance from construction workspace, and any proposed measures to minimize or avoid impacts on the private water wells or springs.**

Construction grading, clearing, trench excavation, and blasting have the potential to affect water well quality through a short-term increase in turbidity at nearby wells and/or springs. Heavy construction equipment and excavation could physically damage wells. Spills of fuels and hazardous substances during construction also have the potential to affect shallow groundwater sources. Additionally, blasting may impact water well yields since vibrations caused by blasting have the potential to locally affect bedrock fractures within the bedrock aquifer, which could temporarily result in diminished well yields and increased turbidity. Details of blasting locations, procedures, and mitigation measures are included in section 4.1.4.7. Potential impacts on wells and shallow groundwater sources are discussed in more detail below in section 4.3.1.7.

If springs are identified that could be affected by construction activities, Mountain Valley would consult with the appropriate regulatory agencies and with individual landowners to minimize impacts. In areas where a public or private water supply well or spring is identified within 150 feet of the Project, Mountain Valley would flag the wellhead or spring as a precaution, and notify the water supply well owner/operator of Project activities prior to commencing construction in that area.

As described in the Project's *Water Resources Identification and Testing Plan*[8], Mountain Valley would offer pre-construction and post-construction water quality testing for water supply wells located within 150 feet of Project workspaces. With landowners' permission, Mountain Valley would conduct two pre-construction water quality and yield evaluations on water wells and springs. One pre-construction evaluation would be conducted 6 months prior to construction and the second pre-construction evaluation would be conducted 3 months prior to construction.

Pre-construction and post-construction water quality analysis would test for the target analytes based on EPA guidance on Analytic Methods for Drinking Water (EPA, 2019). The target analytes include: pH, specific conductance, temperature, turbidity, total and fecal coliform bacteria, total dissolved solids, total suspended solids (TSS), hardness, alkalinity, sulfate, chloride, nitrate, bicarbonate, calcium, magnesium, sodium, potassium, iron, manganese, oil and grease, volatile and semi-volatile organic compounds, and hydrocarbons. Mountain Valley has also agreed to conduct water yield testing during the pre-construction and post-construction sampling.

Mountain Valley would evaluate any complaints of damage to water supply wells associated with construction of the Project and identify a suitable settlement with the landowner if damage occurs. If it is determined that suitable potable water is no longer available due to construction-related activities, Mountain Valley would provide adequate quantities of potable water during repair or replacement of the damaged water supply. In the event that an impact occurs to a livestock well, Mountain Valley would provide a temporary water source to sustain livestock while a new water supply well is constructed. In the event that an impact occurs to an irrigation well used for crops, Mountain Valley would compensate landowners for losses in crops resulting from well damage and provide a temporary water source while a new permanent water supply is constructed.

For public water supplies, existing documentation of well production would be used to establish baseline yield. The pre-construction testing program would be updated to include a tailored analysis list that meets the requirements of the public supplier permit and is agreed upon by the public supplier. If it is determined that a long-term solution is required, Mountain Valley would restore the well's water quality and yield to pre-construction conditions by providing the

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8 Mountain Valley's *Water Resources Identification and Testing Plan* was included in the March 05, 2019 filing. The *Water Resources Identification and Testing Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190305-5214 in the "Numbers: Accession Number" field.

affected public supply source with either a new permanent treatment system, a new on-site well, or a combination of both.

The Project does not propose to use groundwater for hydrostatic testing, dust control, or HDD. However, some groundwater would be removed from the trench during dewatering. Water pumped from the trench during dewatering activities would be released back into the same drainage basin thus not constituting a consumptive use of groundwater from the basin. Mountain Valley would comply with all federal, state, and local agencies permits and requirements for water procurement and water releases, so as to minimize impacts on groundwater resources. Considering the small amount of water withdrawn and released during construction activities, and measures that would be implemented to reduce impacts from water withdrawals and release, the Project would not significantly change the availability of groundwater in the area.

4.3.1.3 Wellhead and Source Water Protection Areas

The 1986 amendment to the Safe Drinking Water Act (SDWA) requires each state to develop and implement a wellhead protection program. In 1996, the SDWA was amended to require the development of a broader-based Source Water Assessment Program (SWAP). The intent of each state's SWAP is to assess contamination threats to all public groundwater and surface water drinking water sources. No wellhead protection areas were identified in Rockingham or Alamance Counties, Virginia or Pittsylvania County, North Carolina.

4.3.1.4 Contaminated Groundwater

Existing contaminated groundwater resources may be encountered during construction of the Project. Contaminated groundwater may pose health and safety concerns to construction workers and potentially elevate environmental risk. The EPA's Facility Registry Service database was used to identify contaminated sites located within 0.25 mile of the Project. Additional federal, state, and local databases containing information of known locations of current and historic contamination were used to identify locations of potential contamination concern. The nearest site with an active or unresolved status is more than 400 feet from the Project workspaces[9]. Further discussion of potential contaminated sites is provided in section 4.2.7.

Disturbance of contaminated groundwater by construction activities could potentially elevate environmental risk. During construction, facilities and equipment may contain hazardous water or fluids, such as oil and fuel, which could leak or be spilled. Proper storage, containment, and handling procedures, as outlined in the SPCC Plan, would minimize the chance of spills and leaks.

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9 The list of hazardous sites within 0.25 mile of the Project was included as part of Resource Report 8 in its November 6, 2018 application. The application can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

4.3.1.5 General Impacts and Mitigation

The construction of the Project could encounter shallow groundwater during excavation of the trench to install the pipe. Trench dewatering could temporarily alter overland water flow, groundwater recharge, and groundwater levels in the immediate vicinity of the trench. Construction grading, clearing, trench excavation and trench blasting could temporarily alter overland water and groundwater recharge and create minor fluctuations in groundwater levels. Ground disturbance associated with construction could potentially increase erosion and sedimentation and result in elevated levels of turbidity.

Trenches are not expected to inhibit groundwater flow because they would be immediately backfilled following pipeline installation and the pipeline is not large enough to both laterally and vertically impede groundwater flow. In addition, the pipeline would not inhibit water infiltration because the pipe would not be large enough to create an impermeable barrier over the aquifer.

Once construction is complete, Mountain Valley would re-establish vegetation and restore the ground surface to original contours as closely as practicable. Restoration would facilitate establishment of pre-construction overland water flow and recharge patterns. Use of construction practices outlined in FERC’s Plan and Mountain Valley’s Procedures, and the Project-specific E&SC Plan would minimize impacts of the Project.

The Project’s SPCC Plan addresses the prevention and mitigation measures that would be implemented to avoid or minimize the potential impacts of a hazardous material spill during construction. Measures outlined in the SPCC Plan include, but are not limited to:

- identification, labeling, and reporting of all potential pollutant sources at the work site;
- regular inspection of containers and tanks for leaks;
- prohibition of fueling, lubricating activities, and hazardous material storage in or adjacent to sensitive areas;
- use of secondary containment for storage of fuels, oils, hazardous materials, and equipment;
- implementation of emergency response procedures, including spill reporting procedures; and
- use of standard procedures for excavation and disposal of any soils contaminated by spillage.

Environmental inspectors would be trained to detect evidence of soil and groundwater contamination (e.g., visible sheen). If contaminated groundwater is encountered during construction, Mountain Valley would implement the measures outlined in its *Unanticipated Discovery of Contamination Plan*. Construction activities would be suspended and the area around potential contamination would be restricted. Sampling and remediation efforts would be undertaken to identify and contain the contamination. Mountain Valley would mobilize an appropriate contractor to segregate and dispose of contaminated soils. Mountain Valley would notify the affected landowner and the appropriate federal or state agency of the contamination and clean-up efforts.

Groundwater contamination from pipeline operations is unlikely because the pipeline would carry methane, a substance lighter than air that would rapidly dissipate in the event of a leak. Additionally, methane has a solubility limit of 3.5 milliliter/100 milliliter of water at a temperature of 17°C, degasses from an aqueous solution, and is considered non-toxic when dissolved in water. As a result, there is no risk of methane dissolution into groundwater. In addition, Mountain Valley would regularly monitor the pipeline for signs of leaks.

As previously stated, blasting has the potential to affect groundwater quality through a short-term increase in turbidity at nearby wells and/or springs. Although no springs have been identified within 150 feet of the Project areas, blasting may impact groundwater yield by altering the discharge to springs in the vicinity of blasting areas. Vibrations caused by blasting also have the potential to locally affect bedrock fractures within the bedrock aquifer, which could temporarily result in diminished well yields and increased turbidity.

In areas of shallow bedrock, Mountain Valley would use mechanical methods to excavate the pipeline trench when possible. However, blasting may be necessary to achieve the required trench depth if these methods prove to be ineffective or inefficient. Mountain Valley would minimize or avoid impacts on groundwater during blasting by implementing the construction practices outlined in its *General Blasting Plan*. As stated in the *General Blasting Plan*, licensed blasting contractors would conduct the blasting activities in accordance with all applicable permits. Mountain Valley would conduct pre-construction and post-construction water quality testing for groundwater supply resources within 150 feet of the Project's construction workspace. If it is determined that blasting activities caused an adverse effect to a specific groundwater supply, Mountain Valley would work with the owner to ensure they have water until the damaged supply is repaired or replaced, at Mountain Valley's expense.

4.3.1.6 Groundwater Conclusions

Temporary, minor, and localized impacts could result during trenching activities in areas with shallow groundwater (at depths less than 10 feet below the ground surface). Mountain Valley would implement BMPs to protect groundwater resources, including erosion controls, restoration of the right-of-way, revegetation, and enhanced mitigation BMPs as discussed above.

Mountain Valley would also adhere to all applicable federal, state, and local requirements to protect groundwater resources. We conclude that the groundwater mitigation measures proposed by Mountain Valley would adequately avoid or minimize potential impacts on groundwater resources. Therefore, we do not anticipate long-term or significant impacts on groundwater resources as a result of construction or operation of the Project.

4.3.2 Surface Water Resources

The USGS classification for surface waters divides drainage basins into successively smaller hydrologic units. Each hydrologic unit is identified by a unique hydrologic unit code, referred to as a HUC, consisting of two to 12 digits. The Project crosses four sub-basins (8-digit HUC) and six watersheds (10-digit HUC), which are listed in table 4.3-2.

In general, the watersheds crossed by the Project contain development consistent with a rural environment. The watersheds contain forests, open land, agriculture, silviculture, and residential development. Development in the watersheds results in some degradation of water quality. For instance, agricultural runoff or runoff from cleared areas in a typical rain event will cause short-term turbidity in streams. We expect that the water quality and biota within the Project area streams is largely reflective of the degree of upstream development.

TABLE 4.3-2

Watersheds Crossed by the Southgate Project

County	Milepost	Sub-basin (8-digit HUC) a/	Watershed (10-digit HUC)
Virginia			
Pittsylvania	0.0-10.8	Banister River (03010105)	Cherrystone Creek-Banister River (0301010501)
	10.8-19.9	Upper Dan (03010103)	Wolf Island Creek-Dan River (0301010310)
	19.9-26.1		Cascade Creek-Dan River (0301010309)
North Carolina			
Rockingham	26.1-39.7	Upper Dan (03010103)	Cascade Creek-Dan River (0301010309)
	39.7-48.2	Lower Dan (03010104)	Hogans Creek-Dan River (0301010401)
	48.2-52.6	Haw River (03030002)	Headwaters Haw River (0303000202)
Alamance	52.6-56.1	Haw River (03030002)	Headwaters Haw River (0303000202)
	56.1-73.2		Back Creek-Haw River (0303000204)

Sources: VADEQ, 2018c; NCDEQ, 2018c

a/ HUC is a classification system developed by the USGS to classify drainage basins from the regional level to individual watersheds.

4.3.2.1 Protected Watersheds and Public Supply Intakes

North Carolina

The North Carolina Division of Water Resources (NCDWR) Water Supply Watershed Protection Program is a cooperative program administered by local governments which follows statewide management requirements. The program designates critical and protected watershed areas. Critical watershed designations apply to areas upstream of a water supply intake or reservoir where pollution risk is elevated. The designation covers the area extending 0.5 mile, or to the top of the nearest ridgeline (whichever is closest), from the edge of the normal pool elevation. Protected watershed designations apply to areas adjoining and upstream of the critical watershed designation in a WS-IV water supply area. Watershed designations restrict development density but do not include any additional restrictions for pipelines or specific erosion and sediment control requirements.

No public water supply intakes are located within three miles downstream of the Project in North Carolina. The Project would cross two designated protected watersheds and one designated critical watershed in North Carolina. The critical watershed and surrounding protected watershed are associated with Stony Creek (WS-II, HUC-10: 0303000204). The second protected watershed is associated with the Haw River (WS-IV, HUC-10: 0303000202). The Project would cross a total of approximately 7.1 miles of designated protected watershed area and 1.5 miles of designated critical watershed area. Mountain Valley would implement mitigation measures specified in FERC's Plan and Mountain Valley's Procedures, and its Project-specific E&SC Plan to minimize any potential impacts on public water sources.

Virginia

The Virginia Department of Health Office of Drinking Water (VADH-ODW) maintains the SWAP in Virginia for both ground and surface water. Because the program is voluntary and lacks reporting requirements, an accurate database of ground and surface water sources does not exist. The VADEQ classifies 16 waterbodies crossed by the Project as public water supply; however, no public surface water supply intakes are located within 3 miles of the Project in Virginia. VADEQ classifications are discussed further in section 4.3.2.3.

4.3.2.2 Surface Water Crossings

The FERC Procedures define waterbodies as any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. Perennial waterbodies contain water for most of the year. Intermittent streams include those that flow only seasonally or following rainfall events. Ephemeral waterbodies include those that only carry stormwater in direct response to precipitation, with water flowing only during and shortly after large precipitation events.

The FERC Procedures further categorize waterbodies by their size as minor, intermediate, or major crossings. Minor waterbodies are less than or equal to 10 feet wide at the water's edge. Intermediate waterbodies are greater than 10 feet wide but less than or equal to 100 feet wide. Major waterbodies are greater than 100-feet-wide. Table 4.3-3 summarizes the waterbodies crossed by the Project. A complete list of waterbody crossings pending COE's field review is located in appendix B.5.

The Project would require 224 crossings of waterbodies, 3 of which are major waterbodies. The Project crossings would follow Mountain Valley's Procedures and E&SC Plan. Four crossings would be conventional bore and two crossing would be HDD. All other crossing would be dry-ditch crossing methods (dam-and-pump or flume method). Mountain Valley would determine if it would use the dam-and-pump or flume crossing method at each crossing based on-site conditions using FERC guidance and Mountain Valley's E&SC Plan. Descriptions of these crossing methods are located in section 2.4.1. In-water work windows may be required for protected mussel species as determined by results of pending mussel surveys. All in-stream work would be conducted during low flow periods when practicable.

TABLE 4.3-3

Flow Types of Waterbody Crossings for the Southgate Project a/

Project/ State	FERC Size Classification				Flow Type				
	Minor	Inter.	Major	Total	Pond	Perennial	Intermittent	Ephemeral	Total
H-605 (Virginia)	1	0	0	1	0	0	1	0	1
H-650 (Virginia)	37	25	0	62	1	37	20	4	62
H-650 (North Carolina)	124	34	3	161	1	88	52	20	161
Total	**162**	**59**	**3**	**224**	**1**	**125**	**72**	**28**	**224**

Inter. = Intermediate

a/ Some waterbodies would be crossed at more than one location. This table accounts for each crossing of all affected waterbodies.

Conventional bore and HDD crossing methods both avoid direct impacts on waterbodies by boring underground to cross the waterbody instead of trenching through the streambed and banks. For both crossing methods, Mountain Valley would place boring locations outside of the waterbody and associated riparian area and no disturbance of the waterbody is required. Conventional bore and HDD crossing methods are proposed for crossings where sensitive fish or mussel species presence required the crossing to avoid waterbody disturbance. HDD crossings are typically used for waterbody crossings unless local conditions require a conventional bore. Additional information regarding sensitive species at waterbody crossings is included in section 4.6.5.

Mountain Valley would use HDD crossings at the Dan River (247 feet wide at MP 30.1) in Rockingham County, North Carolina and the Stony Creek Reservoir (304 feet wide at MP 63.6) in Alamance County, North Carolina. Both crossings are major waterbodies. HDD crossing methods are required for these crossings due to the long distance of each crossing and topographic constraints on pit excavation for a conventional bore crossing. Section 4.1.4.10 contains further description and analysis of the proposed HDD crossings. Potential impacts associated with the HDD method are described further below in section 4.3.2.7.

The conventional bore crossing at Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek are proposed due to the potential presence of federal or state-listed aquatic species in these systems. Cascade Creek is a major waterbody, Wolf Island Creek is an intermediate waterbody, and Deep Creek is a minor waterbody. Dry Creek is an intermediate waterbody that would also be crossed by the Cascade Creek conventional bore since the pipeline crossing at this location is at the convergence of Cascade Creek and Dry Creek. In comparison with HDD crossing methods, using conventional bore methods at the Cascade/Dry Creek crossing would result in a substantially shorter crossing length, construction time, and temporary workspace impacts. The proximity of Cascade/Dry Creek to the existing Transco pipeline right-of-way poses additional construction hurdles to an HDD crossing. The Wolf Island Creek crossing does not have sufficient space in the current alignment to accommodate the temporary workspace that would be required for an HDD crossing. Whereas, a conventional bore crossing requires less temporary workspace and would be feasible within the current alignment. Conventional bores require large entry and exit pit excavations at each end of the bore pathway and therefore create the risk of sediment runoff entering the adjacent waterbody. Of greatest risk to the waterbody is the possibility of the borehole collapsing without warning. In such a case the bed of the waterbody could collapse and reroute the waterbody into the bore pathway. As with its other construction methods, Mountain Valley would implement measures to reduce runoff from the construction right-of-way as provided in FERC's Plan and Mountain Valley's Procedures and E&SC Plan. Mountain Valley would allow for a vegetative buffer on each side of the waterbody crossing to the extent practicable as noted in the site-specific crossing plans[10]. Mountain Valley would use a casing, if required, to prevent the bore from collapsing.

Mountain Valley has developed preliminary site-specific plans for each of the HDD and conventional bore crossings, which we have reviewed and find acceptable. However, these plans are not yet final. If the Project is certificated, Mountain Valley would provide final site-specific plans prior to construction for review and approval by Commission staff.

Due to site access constraints at the Deep Creek crossing, Mountain Valley has not completed the feasibility studies required to finalize the conventional bore crossing plan. In the event a conventional bore is not feasible at this location, Mountain Valley would propose an alternative crossing method (e.g. HDD). Because studies are outstanding for Deep Creek, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, a final crossing plan for Deep Creek that outlines the crossing method and any proposed mitigation measures to minimize waterbody impacts at the crossing.**

The FERC Procedures specify that all extra work areas should be set back at least 50 feet from waterbodies and wetlands. Mountain Valley has proposed ATWSs at 11 locations within 50 feet of a waterbody. Appendix B.3 provides the locations where Mountain Valley proposes less than a 50-foot setback from a waterbody and the site-specific rationale for the requested modification from FERC Procedures. Based on our review, and additional justifications provided by Mountain Valley, we have determined that Mountain Valley has provided adequate justification for the requested ATWSs.

Waterbody crossings would be aligned perpendicular to the axis of the waterbody channel as closely as local conditions and engineering constraints allow. In accordance with the FERC Procedures, when a pipeline route runs parallel to a waterbody, the Project would maintain a 15-foot buffer of undisturbed vegetation between the waterbody, or adjacent wetland, and the construction workspace, unless local conditions do not allow the setback. Mountain Valley is requesting modification to the FERC Procedures at 28 locations where the Project would parallel a waterbody, or adjacent wetland, within 15 feet. Parallel locations are needed to avoid

[10] Mountain Valley's site-specific crossing plan for the Sandy River was included as attachment 14-1 to Mountain Valley's March 13, 2019 response to the April 23, 2019 FERC EIR. The site-specific crossing plan for the Sandy River can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190513-5181 in the "Numbers: Accession Number" field.

construction on side slopes, to collocate the pipeline with existing rights-of-way, or to avoid residences. We have reviewed all of the justifications for the parallel locations and find them all to be acceptable. Appendix B.8 includes details for each location.

4.3.2.3 Contaminated Sediments and Impaired Waters

CWA Section 303(d) requires that each state review, establish, and revise water quality standards for all surface waters within each state. State classification systems develop monitoring and migration programs to ensure that water standards are attained as designated. Waters that fail to meet their designated beneficial use are considered as impaired and are listed under a state's 303(d) list of impaired waters.

North Carolina

In February 2014, the Eden North Carolina Coal Ash Spill occurred approximately 2.3 river miles upstream from the Project's crossing of the Dan River at MP 30.1 in Rockingham County (EDR, 2018). An estimated 39,000 tons of coal ash spilled from Duke Energy's Dan River Steam Station into the Dan River. In 2015, after extensive clean-up efforts, the EPA determined that the Dan River needed no further ash removal and that no exceedances of human health or ecological screening thresholds associated with coal ash had occurred. Mountain Valley proposes to cross the Dan River via HDD and no in-stream disturbance is anticipated. Due to the clean-up efforts and the HDD crossing, no impacts associated with this coal ash release are expected.

The NCDEQ lists the Dan River as impaired in North Carolina due to turbidity in the draft 2018 NCDEQ 303(d) list (NCDEQ, 2018b). Because Mountain Valley would cross the Dan River using HDD, we do not expect the Project to contribute to further impairment of the Dan River due to turbidity. The majority of other waterbodies crossed in North Carolina have not been assessed for impairment or are classified as Category 3a (Inconclusive Data).

Virginia

Virginia Antidegradation Policy (9VAC25-260-30) classifies all surface waters into one of three tiers that determines antidegradation protection (additional information is provided in section 4.3.2.6). Tier I crossings require satisfying adopted water quality standards. Tier II crossings permit limited negative effects on water quality only in specific circumstances. The VADEQ considers Tier III waters exceptional quality and increased pollutant discharge is prohibited. Tier I and II crossing requirements are addressed by the E&SC Plan and impacts are not expected to affect water quality. The Project does not cross any Tier III waters in Virginia.

Three waterbodies crossed by the Project in Virginia are designated as Category 4a Impaired (VADEQ, 2018b). Little Cherrystone Creek, White Oak Creek (crossed twice), and Sandy Creek are listed as impaired due to *Escherichia coli*. The VADEQ lists the Dan River in Virginia as impaired due to *Escherichia coli* as well as mercury and polychlorinated biphenyl (PCB) levels in fish tissues. In addition the VADEQ lists the Banister River as being impaired with *Escherichia coli*. However, it should be noted that the portions of the Banister River and the Dan River listed as impaired are downstream from the Project crossing locations. The majority of other waterbodies crossed in Virginia have not been assessed for impairment or are classified as Category 3a (Inconclusive Data).

Mountain Valley would cross impaired waters in Virginia using a dry crossing technique (e.g. flume or dam-and-pump) if there is flowing water at the time of construction. Mountain Valley would use BMPs and measures outlined in FERC's Plan and Mountain Valley's Procedures, as well as the Project-specific E&SC Plan to maintain stream conditions and minimize further impairment. Furthermore, Mountain Valley would design and install BMPs to control soil erosion and sedimentation down gradient of construction areas. Once the waterbody crossing is complete, Mountain Valley would restore construction areas and re-establish vegetation in order to prevent erosion and sedimentation along waterbodies.

We do not anticipate that a pipeline installed underneath waterbodies would contribute to the impairment of streams for *E. coli* and therefore would not contribute to the further impairment of Little Cherrystone Creek, White Oak Creek, and Sandy Creek in Virginia. VADEQ commented that hydroseeding could be a contributing factor to polychlorinated biphenyl (PCB) concentrations in the Dan River (VADEQ, 2018b). The Project would avoid hydroseeding within 100 feet of direct tributaries to the Dan River.

4.3.2.4 Federal and State Designated Use and Exceptional Waters

National Wild and Scenic Rivers

The Nationwide Rivers Inventory (NRI) designates free-flowing river segments in the United States that possess outstandingly remarkable natural or cultural values, which are considered to be of national significance (NPS, 2017). The National Park Service (NPS) maintains the NRI as a list of river segments that potentially qualify as national wild, scenic, or recreational river areas. In addition to the NRI database, we reviewed the National Wild and Scenic River System database to identify federally designated wild, scenic, or recreational waterbodies.

The segment of the Dan River crossed by the Project is included in the NRI list, but not designated as a National Wild and Scenic River. The NPS consultation indicated that an HDD crossing of the Dan River and implementation of appropriate BMPs would reduce potential impacts on the river and the surrounding landscape. Mountain Valley would install applicable BMPs outlined in the E&SC Plan and would implement the *HDD Contingency Plan* as described in section 4.1.

State Scenic Rivers

Virginia administers the Virginia Scenic River Program to identify, designate, and protect rivers and streams that possess outstanding scenic, recreational, historic, and natural characteristics of statewide significance. The Sandy River is an intermediate waterbody crossed by the Project and qualifies for a potential designation that may result in a scenic river designation in the future. The Project would cross the Sandy River by using a dry crossing method (flume or dam-and-pump) crossing method. Using a dry crossing method for the Sandy River would have a limited impact on a potential designation as a state scenic river because the crossing would be collocated with the existing Transco right-of-way. Because the existing right-of-way is already maintained, the new crossing would only require an additional 10 feet of maintained right-of-way during operation. The new crossing would minimize impacts and add a minimal increase to the existing right-of-way. Additionally, routine vegetation mowing or clearing adjacent to the Sandy River would be limited. Mountain Valley would use applicable BMPs to minimize impacts, as outlined in the E&SC Plan.

The Project does not cross other waters designated in the Virginia Scenic River Program. The Project would cross the Banister River which has a potential Virginia Scenic River Program future designation as a Blueway (a designated recreational water trail). However, the current construction schedule anticipates that the Project would be complete prior to any listing as a Blueway. The Project's effects on boating and recreational use of the Sandy and Banister rivers is discussed in section 4.8.4.1.

North Carolina administers a river designation intended to protect specific rivers with outstanding natural, scenic, educational, recreational, geologic, fish and wildlife, historic, scientific, cultural or other values. The Project does not cross any North Carolina rivers with these designations.

State Designated Use and Exceptional Waters.

Virginia maintains a program administered by VADEQ that uses six primary designations: aquatic life, fish consumption, public water supply, recreation use, shellfishing, and wildlife use. The VADEQ uses additional subcategories in the classification system, but none of the subcategories applies to waters crossed by the Project. The majority of the waters crossed by the Project have not been assessed and default to the basic four classifications (aquatic life, recreation, fish consumption, and wildlife). Waterbodies crossed by the Project include the following classifications: aquatic life, wildlife, fish consumption, and recreation. Some of the waterbodies crossed by the Project are also designated for the public water supply use. Crossings would use applicable BMPs as established in Mountain Plan and Procedures and the E&SC Plan to minimize impacts.

The NCDWR has established surface water designations that define the best uses to be protected within these waters. The designations identify water quality standards that protect those uses. The Project would cross waters with the following designations:

- Class C: Secondary use for recreation, fishing, wildlife, fish consumption, and aquatic life.
- High Quality Waters (HQW): Supplemental classification to protect waters rated as exceptional for biological or physical/chemical characteristics.
- Nutrient Sensitive Waters (NSW): Waters needing additional nutrient management due to excessive growth of microscopic or macroscopic vegetation.
- Water Supply II (WS-II): Water sources for drinking, culinary, or food processing where a Water Supply I (WS-I) classification is not feasible. WS-II waters are generally in predominantly undeveloped watersheds. All WS-II waters are also designated HQW and Class C.

- Water Supply IV (WS-IV): Water sources for drinking, culinary, or food processing where a WS-I, WS-II, or WS-III classification is not feasible. WS-IV waters are generally in moderately to highly developed watersheds. All WS-IV waters are also designated Class C.
- Water Supply V (WS-V): Water supplies draining into WS-IV waters, waters used by industry to supply drinking water to employees, or waters formerly used as water supplies. All WS-V waters are also designated as Class C.

All but four of the waters crossed by the Project in North Carolina are designated only as Class C. The two waters designated as WS-II and HQW would be crossed by HDD (Stony Creek Reservoir, MP 63.6) or conventional bore (Deep Creek, MP 64), thus minimizing any disturbance to the waterbody. The Project would cross one WS-V and NSW designated waterbody (Boyds Creek, MP 67.6) and one WS-IV and NSW designated water (Giles Creek, MP 48.7) via dam-and-pump or flume methods. Crossings would use applicable BMPs as established in the E&SC Plan to minimize impacts. As requested by the City of Burlington, North Carolina, Mountain Valley is working to confirm the HDD crossing of Stony Creek would not cross city property. The VADGIF and NCWRC maintain state lists of designated trout waters based on aesthetics, productivity, resident fish population, and stream structure. The Project does not cross any VADGIF or NCWRC designated trout waters.

All waterbodies crossed by the Project are designated warmwater fisheries. The FERC requires all in-stream work, except the installation and removal of equipment bridges, be completed in warmwater fisheries between June 1 and November 30 unless expressly permitted or further restricted by an appropriate federal or state agency in writing. In response to a FERC environmental information request regarding adherence to in water construction windows, Mountain Valley responded that based on correspondence with Virginia and North Carolina state agencies no construction windows were anticipated except possibly for mussels. However, Mountain Valley has not provided any written correspondence from the VADGIF and NCWRC regarding any timing restrictions on waterbodies containing warmwater fisheries. Though aquatic surveys have determined that protected fish and mussel species are not present in streams in Virginia, consultation with the VADGIF is currently ongoing. Consultation with NCWRC and aquatic surveys in North Carolina are still pending, including streams that are proposed to be crossed via conventional bore or HDD methods. Additional details of specific fisheries and agency consultation are addressed in section 4.7. Absent any waivers from or further restrictions on in-water work timing from VADGIF and NCWRC, Mountain Valley is required to follow the warmwater fisheries timing window in its Procedures (June 1 through November 30).

North Carolina Jordan Lake Riparian Buffer Area

The Jordan Lake impoundment was created in 1983 on the Haw River near the confluence with the Deep River. Jordan Lake provides drinking water to approximately 500,000 people and provides recreational swimming, boating and fishing opportunities to the area. The Jordan Lake impoundment is located 25 miles from the pipeline but the watershed is included in a riparian buffer area as part of a strategy to improve water quality in the lake. The watershed is considered the Jordan Lake Riparian Buffer (JLRB) area and is divided into multiple subwatersheds. The Project crosses the Haw River subwatershed for approximately 24 miles (MP 49-73) in

Rockingham and Alamance Counties. Project construction within JLRB area would follow requirements identified in the Jordan Watershed Riparian Buffer Protection Ordinance. Mountain Valley is working with the NCDEQ to complete an application for a 401 Individual Water Quality Certification and Buffer Authorization for impacts proposed within the JLRB area. The application would include a major variance request for specific stream impacts and provide mitigation for impacts as outlined under NCDEQ rules. Mountain Valley has provided variance justification for non-perpendicular waterbody crossings in the JLRB area that appear to meet siting rules. Justifications focused on collocation of the pipeline with existing infrastructure right-of-way, minimizing Project footprint, and avoiding residences or existing infrastructure (e.g. roads, landowner structures). Implementation of FERC's Plan and Mountain Valley's Procedures; E&SC Plan; and applicable buffer protection requirements would minimize potential impacts on surface waters within the JLRB area.

Mountain Valley submitted its Section 401 applications to the NCDEQ in November 30, 2018. On June 3, 2019, NCDEQ issued a letter of denial of the Section 401 Water Quality Certification and JLRB variance for the Project. Mountain Valley continues to coordinate and plans to resubmit a Section 401 and JLRB variance application.

4.3.2.5 Designated Flood Zones

The Federal Emergency Management Agency (FEMA) has prepared Flood Insurance Rate Maps that delineate Special Flood Hazard Areas (SFHA). FEMA defines SFHAs as the area that would be inundated by a 100-year (1 percent annual chance of occurrence) flood event. SFHAs are further categorized into zones. The Project crosses A and AE designated flood zones in Virginia and North Carolina. Zone A is the FEMA designation for areas subject to inundation by the 1-percent-annual-chance flood and where predicted floodwater elevations have not been established. Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods and where predicted floodwater elevations above mean sea level have been established (FEMA, 2018). Table 4.3-4 identifies the FEMA flood zones crossed by the pipeline.

No access roads or interconnection meter stations would be located within the FEMA 100-year flood zone in Virginia. Two permanent access road and one interconnection meter station would be located within the FEMA 100-year flood zone in North Carolina. All permanent impacts would occur in the Cascade Creek-Dan River watershed (HUC-10) which totals 10,469 acres in size. Two permanent gravel access roads (PA-RO-082, PA-RO-082A) would occupy a 0.2 acre area but would not create any new floodplain displacement because they are existing roads which do not require improvement. The T-15 Dan River Interconnect/MLV 4 facilities would occupy a 0.8 acre area but site design would be largely at grade and total net floodplain displacement would be zero. Temporary access roads would disturb 6.5 acres within floodplains and may have a temporary impact on flood storage capacity. However, Mountain Valley would restore all temporary impacts after construction and result in no permanent impact to flood storage. Mountain Valley may leave in place some temporary access roads if requested by the landowner or agency.

TABLE 4.3-4

FEMA 100-year Floodplains Crossed by the Southgate Project

Floodplain Waterbody	Flood Zone a/	Entry MP	Exit MP	Crossing (ft)
Virginia - Pittsylvania County				
H-605 Pipeline		No Flood Zones Crossed.		
H-650 Pipeline				
Little Cherrystone Creek	A	0.3	0.4	556
Cherrystone Creek	AE	1.4	2.2	4,357
Banister River	AE	4.8	5.1	1,260
White Oak Creek	AE	5.1	5.2	771
White Oak Creek	AE	6.6	6.6	174
White Oak Creek	A	8.5	8.6	266
White Oak Creek	A	9.9	9.9	220
Sandy Creek	AE	12.7	12.8	210
Sandy Creek	AE	13.4	13.5	318
Silver Creek	A	15.7	15.7	172
Sandy River	AE	17.7	17.8	258
Trotters Creek	A	23.2	23.2	57
North Carolina – Rockingham County				
Cascade Creek	AE	27.1	27.8	3,665
Dry Creek	AE	27.8	27.8	32
Dry Creek	AE	27.9	28.0	668
Dry Creek	AE	28.0	28.1	97
Dan River	AE	28.3	28.4	204
Dan River	AE	29.6	29.6	22
Dan River	AE	29.6	30.5	4,741
Dan River	AE	30.5	30.6	315
Rock Creek	AE	30.7	30.7	150
Rock Creek	AE	30.7	30.9	941
Machine Creek	AE	32.1	32.2	37
Machine Creek	AE	32.2	32.2	196
Machine Creek	AE	32.2	32.2	10
Town Creek	AE	32.6	32.7	526
Town Creek	AE	33.0	33.1	470
Town Creek	AE	33.1	33.1	32
Wolf Island Creek	AE	38.6	38.8	886
Lick Fork	AE	41.1	41.2	320
Jones Creek	AE	43.2	43.3	551
Hogans Creek	AE	46.4	46.5	88
Hogans Creek	AE	46.9	47.0	341

TABLE 4.3-4

FEMA 100-year Floodplains Crossed by the Southgate Project

Floodplain Waterbody	Flood Zone a/	Entry MP	Exit MP	Crossing (ft)
Giles Creek	AE	48.6	48.7	353
Haw River	AE	50.8	50.8	95
North Carolina – Alamance County				
Haw River	AE	53.6	53.7	198
Haw River	AE	54.6	54.6	125
Haw River	AE	56.4	56.4	26
Haw River	AE	56.6	56.6	281
Haw River	AE	57.0	57.0	304
Haw River	AE	57.9	57.9	8
Haw River	AE	58.6	58.7	322
Haw River	AE	60.7	60.7	76
Haw River	AE	60.7	60.8	47
Stony Creek Reservoir	AE	63.6	63.6	350
Stony Creek Reservoir	AE	63.6	63.6	4
Deep Creek	AE	63.8	63.9	100
Deep Creek	AE	64.0	64.0	377
Boyds Creek	AE	65.6	65.6	115
Boyds Creek	AE	67.6	67.6	153
Haw River	AE	69.1	69.1	222
Haw River	AE	69.1	69.3	894
Haw River	AE	70.2	70.3	320
Haw River	AE	70.7	70.8	254
Haw River	AE	70.9	70.9	253
Haw River	AE	70.9	71.0	115
Haw River	AE	71.3	71.3	328
Haw River	AE	71.3	71.8	2,536
Haw River	AE	72.5	72.7	1,279
Haw River	AE	72.9	73.1	824

Source : FEMA, 2018

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

4.3.2.6 Surface Water Appropriations

Hydrostatic Test Water

Water would be required for the Project to perform hydrostatic testing of the pipeline. Mountain Valley would use a total of 5.9 million gallons of water from two municipal water sources for hydrostatic test water (see table 4.3.5).

TABLE 4.3-5

Hydrostatic Test Water Sources and Discharge Locations for the Southgate Project

MP	Required Water (gallons)	Proposed Water Source	Proposed Discharge MP	Proposed Discharge Watershed
0.0-30.4	3,600,000	Municipal	0.0	Roanoke River Basin
30.4-732	2,300,000	Municipal	30.4	Cape Fear River Basin

Mountain Valley would store the test water in tanks prior to pumping it into the pipe. To reduce the total amount of water needed for testing, Mountain Valley would transfer test water from one test section to the next. Because the Project is using municipal water used for hydrostatic testing, biocide treatment or any other additives are not expected. If chlorinated water is used, a dechlorination agent may be required prior to discharge, depending on the discharge location. No chemicals would be added to test water unless approved by FERC and applicable federal and state regulatory agencies. The test water would contact only new pipe. No desiccant or chemical additives would be used to dry the pipe after testing. Prior to construction, Mountain Valley would apply for the applicable permits to discharge hydrostatic test water.

Horizontal Directional Drill Water

The HDD process requires water to be added to a bentonite clay mixture to create drilling fluid. For this water, Mountain Valley would use municipal water sources from a location specific for each HDD crossing (see table 4.3-6). Mountain Valley may additionally utilize drilling fluid additives that are safe for use during drinking water well construction (comply with National Sanitation Foundation/American National Standards Institute [NSF/ANSI] standard 60) (NSF International, 2018) and comply with federal and state requirements. All drilling fluid would be disposed of at an approved facility or recycled in an approved manner in accordance with the *HDD Contingency Plan*. Mountain Valley would separate all water from HDD equipment washing areas from wetlands or waterbodies by drainage barriers to prevent any runoff entry. Because water would be obtained from municipal sources, no permits are required. If the Project requires other sources of water, Mountain Valley would have to comply with applicable permits in addition to getting approval from the FERC on those specific sources and withdrawal methods as recommended below.

TABLE 4.3-6

HDD Water Requirements by Crossing for the Southgate Project

HDD Crossing	Required Water Hydrostatic Testing HDD (gallons)	Required Water HDD Operations (gallons)	HDD MP
Dan River HDD	60,000	105,000	30.4
Stony Creek Reservoir HDD	16,500	105,000	63.8

Dust Control

Controlling dust on unpaved roads during construction would require water. Water sprayed on road surfaces would only be sufficient to surface crust and is not expected to create runoff. The lead EI would determine locations and disbursement of dust control spraying based on local conditions. Mountain Valley would obtain water for dust control primarily from municipal sources.

Mountain Valley states that, if needed, additional potential sources of water for dust control may include groundwater supply wells and/or approved surface waters. Mountain Valley also stated that it continues to evaluate the need for additional sources of water other than municipal sources for hydrostatic test water and HDD operations. Mountain Valley would screen the intake hose to minimize entrainment of aquatic species and maintain intake rates appropriate to local conditions if surface waters are used. However, we require an opportunity to evaluate whether or not an alternative water source is acceptable prior to its use. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, its final list of water sources to be used for the Project (dust control, hydrostatic testing, and HDD operations), including intake location, waterbody name, withdrawal rate and method, and measures to minimize entrainment of fish.**

4.3.2.7 General Impacts and Mitigation on Surface Water

Construction activities in-stream channels and on adjacent banks may affect waterbodies. Clearing and grading of stream banks, in-stream trenching, the installation and removal of temporary crossing structures (e.g., culverts, cofferdams), trench dewatering, and backfilling could each cause temporary, local modifications of aquatic habitat involving sedimentation, increased turbidity, and decreased dissolved oxygen concentrations; however, in almost all cases, these impacts would be limited to the period of in-stream construction.

In-stream construction would cause a temporary increase in sediments mobilized downstream. The extent of the impact would depend on sediment loads, stream velocity, turbidity, bank composition, and sediment particle size. These factors would determine the density and downstream extent of the turbidity plume. In-stream construction could cause the dislodging and transport of channel bed sediments and the alteration of stream contours. Changes in the stream bottom contours could alter stream dynamics and increase downstream erosion or deposition.

Turbidity resulting from the resuspension of sediments due to in-stream construction and erosion of cleared right-of-way areas could reduce light penetration and photosynthetic oxygen production. In-stream disturbance could also introduce chemical and nutrient pollutants from sediments. Resuspension of deposited organic material and inorganic sediments could cause an increase in biological and chemical use of oxygen, potentially resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause temporary displacement of motile organisms, such as fish, and may kill non-motile organisms within the affected waterbody.

The use of HDD crossings reduces impacts at waterbody crossings by avoiding disturbance to the waterbody bed and bank. However, inadvertent release of drilling fluid can occur during accidental escape of fluid through overlying substrate and into the waterbody. Site-specific HDD crossing plans for each crossing outline the measures that would minimize potential impacts of an inadvertent return to water quality. The HDD crossing plans, and *HDD Contingency Plan*, also provide procedures to monitor, contain, and clean up any inadvertent drilling fluid release.

The clearing and grading of stream banks could expose soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. The use of heavy equipment for construction could cause compaction of near-surface soils, an effect that could result in increased runoff into surface waters in the immediate vicinity of the proposed construction right-of-way. Increased surface runoff could transport sediment into surface waters, resulting in increased turbidity levels and increased sedimentation rates in the receiving waterbody. Disturbances to stream channels and stream banks could also increase the likelihood of scour after construction.

In order to limit impacts on riparian zones, Mountain Valley would follow measures outlined in the FERC's Plan and Mountain Valley's Procedures. These measures allow a riparian strip at least 25 feet wide to permanently revegetate with native plant species across the entire construction right-of-way. A corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state; and trees that are located within 15 feet of the pipeline in wetland riparian areas may be cut and removed from the permanent right-of-way. In addition, Mountain Valley would not clear the riparian areas that are between HDD entry and exit points during construction except for a 3-foot-wide path that would be hand cleared to allow for the HDD guide wire, these areas would not be maintained or mowed during operations.

Dewatering of the pipeline trench and conventional bore pits may require pumping of groundwater in areas where there is a high water table. Dewatering may cause minor temporary fluctuations in surface water turbidity. Mountain Valley would minimize or avoid impacts by implementation of the construction practices outlined in its Procedures, the E&SC Plan, and the *Stormwater Pollution Prevention Plans*[11] for North Carolina and/or Virginia. During construction, discharge of water removed from excavations would be directed to the vegetated land surfaces to control erosion and runoff. If adequate vegetation is absent, water would be filtered through haybale-lined dewatering structures. Because water removed from excavations would be

[11] Filing of Mountain Valley's *Stormwater Pollution Prevention Plans* is pending.

reintroduced in the immediate proximity of excavations, potential dewatering impacts would be localized and temporary and would not affect surface waters.

Mountain Valley would hydrostatically test the pipeline to verify structural integrity prior to placing the Project into service. Water for hydrostatic testing would be obtained from two municipal water sources. To minimize or avoid impacts, Mountain Valley would implement the E&SC Plan and comply with conditions of NPDES permits. To minimize scour, erosion, and sediment transport, hydrostatic test water would be discharged over vegetated land surfaces through energy dissipation devices, filter bags, or hay bale-lined dewatering structures. Additionally, the discharge rate would be regulated using valves and energy dissipation devices.

Blasting may be required within surface water crossings that contain shallow bedrock and can cause a short-term increase in sedimentation. Injury to fish and mussels may also occur from the shockwave created by blasting, however, none of the crossings with sensitive fish or mussel species have the potential to require blasting. To minimize potential blasting impacts on surface waters, Mountain Valley would use blasting as the final option after all other reasonable means of trench excavation are unsuccessful. Blasting at surface waters with intermittent flow, or at crossings of less than 20 feet, would be completed during dry or low flow periods where practicable. Mountain Valley's *General Blasting Plan* details blasting procedures and this plan would minimize any potential sedimentation impacts from the activity.

To minimize or prevent impacts resulting from flash flooding during construction, Mountain Valley would remove any equipment or loose material from potentially affected areas prior to any anticipated significant rain event. Additionally, Mountain Valley would implement erosion and sedimentation control measures, such as installing trench breakers and water bars to inhibit water flow along the trench and right-of-way. Upon completion of construction, Mountain Valley would restore the ground surface as closely as practicable to original contours and re-establish vegetation to facilitate restoration of pre-construction overland flow.

4.3.2.8 Surface Water Conclusions

Temporary and localized impacts on surface waters could result from in-stream construction activities and potential erosion and runoff from upland construction. Mountain Valley would implement FERC's Plan, and Mountain Valley's Procedures and E&SC Plan to protect surface water resources, including reducing sediment loads, restoring stream habitat, and restoring riparian strips along streams. We conclude that the surface water mitigation measures proposed by Mountain Valley would adequately avoid or minimize potential impacts on surface water resources. Therefore, we do not anticipate long-term or significant impacts on surface water resources because of construction or operation of the Project.

4.3.3 Water Resources Conclusions

The Project is not expected to permanently affect surface or ground water resources. Though temporary impacts would result from the Project, with implementation of BMPs and mitigation proposed by Mountain Valley, as well as our recommendations, we conclude the Project would not significantly affect water resources.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions (COE, 1987). Wetlands serve several functions including, but not limited to flood control, groundwater recharge, maintenance of biodiversity, wildlife habitat, and maintenance of water quality.

Wetlands in the Project area are regulated at the federal and state levels. At the federal level, the COE regulates wetlands under Section 404 of the CWA and Section 10 of the RHA. The EPA shares responsibility to administer and enforce the Section 404 program. The COE delegates wetland activities under Section 401 of the CWA to the appropriate state agencies: the VADEQ in Virginia, and the NCDWR in North Carolina.

At the time of this draft EIS, Mountain Valley was unable to survey all parcels; therefore, the total acreages given below were determined through a combination of field survey data and a desktop analysis of National Wetlands Inventory (NWI) data, aerial imagery, and nearby conditions of delineated resources. Wetland field survey data is available where access was granted as of May 2019 (approximately 92 percent of the alignment).

4.4.1 Existing Wetland Resources

Mountain Valley conducted surveys to identify and determine the extent of wetlands crossed along the pipeline routes and access roads, or within ATWS, aboveground facility sites, pipe/contractor yards, and staging areas. Based on USGS data, Virginia and North Carolina currently have approximately 1.0 and 5.7 million total acres of existing wetlands, respectively. Mountain Valley delineated wetlands in accordance with the COE 1987 Wetland Delineation Manual (COE, 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) (COE, 2012). Table 4.4-1 summarizes the wetland types crossed by the Project, and appendix B.6 details each wetland crossing. Three wetland types as described by Cowardin et al. (1979) would be crossed by the Project:

4.4.1.1 Emergent Wetlands

Palustrine emergent (PEM) wetlands are dominated by erect, rooted, herbaceous, perennial hydrophytic vegetation. Emergent wetlands within the Project area are typically dominated by sedges (*Carex spp*.), jewelweed (*Impatiens capensis*), soft rush (*Juncus effusus*), dark green bulrush (*Scirpus atrovirens*), sensitive fern (*Onoclea sensibilis*), tapertip rush (*Juncus acuminatus*), panicled aster (*Symphyotrichum lanceolatum*), and rice cut grass (*Leersia oryzoides*).

4.4.1.2 Scrub-Shrub Wetlands

Palustrine scrub-shrub (PSS) wetlands are dominated by woody vegetation that is less than 20 feet tall, including shrubs, young trees, and trees or shrubs that are small due to environmental conditions. Scrub-shrub wetlands within the Project area are typically dominated by black willow (*Salix nigra*), red maple (*Acer ruburm*), American sycamore (*Platanus occidentalis*), sweetbay magnolia (*Magnolia virginiana*), black elder (*Sambucus nigra*), smooth alder (*Alnus serrulata*), sedges, sensitive fern, jewelweed, and soft rush.

TABLE 4.4-1

Wetland Impacts Associated with the Southgate Project

Type/State a/	Construction (acres) b/	Operation (acres) b/
PEM Wetlands		
Virginia	6.4	0.7
North Carolina	7.3	0.6
Total PEM Wetland Impacts	*13.7*	*1.3*
PSS Wetlands		
Virginia	0.7	0.1
North Carolina	0.5	0.1
Total PSS Wetland Impacts	*1.2*	*0.2*
PFO Wetlands		
Virginia	4.6	1.7
North Carolina	7.3	2.7
Total PFO Wetland Impacts	*11.9*	*4.4*
Total Wetland Impacts	*26.8*	*5.9*

Note: Totals may not sum correctly due to rounding.

a/ PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested (Cowardin et al., 1979).

b/ Construction impacts include those within the operational footprint.

4.4.1.3 Forested Wetlands

Palustrine forested (PFO) wetlands are dominated by woody vegetation that is equal to or greater than 20 feet tall with a tolerance to a seasonally high water table. Forested wetlands within the Project area are dominated by green ash (*Fraxinus pennsylvanica*), red maple, sweetgum (*Liquidambar styraciflua*), American sycamore, American elm (*Ulmus americana*), willow oak (*Quercus phellos*), swamp dewberry (*Rubus hispidus*), and poison ivy (*Toxicondendron radicans*).

Certain wetlands can be considered sensitive or of high or exceptional value because of their ecological quality and high level of functionality. However, no protected wetlands or wetlands of exceptional value have been identified in the Project area.

If the Commission authorizes the Project, Mountain Valley would be required to complete all of the remaining field wetland surveys after access is obtained. Mountain Valley would provide the results of these surveys to the permitting agencies, including the FERC, COE, and appropriate state resource agencies (VADEQ and NCDEQ).

4.4.2 General Impacts and Mitigation

Table 4.4-2 summarizes the impacts of the proposed Project on wetlands. The majority of impacts on wetlands resulting from construction and operation of the Project would be temporary. In accordance with the Mountain Valley's Procedures, Mountain Valley would maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys and would selectively cut trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating. This would result in the conversion of 0.2 acre of PSS wetland to PEM wetland, and 4.4 acres of PFO wetlands to PSS and PEM wetlands within the Project's operational right-of-way.

Aboveground facilities would permanently affect 0.02 acre of wetlands. At the Lambert Compressor Station, an area of PFO would be converted to PEM/PSS for the construction and operation of the post-construction stormwater management system. Mountain Valley is finalizing the stormwater system design and evaluating modifications to avoid any impacts on this wetland. Two permanent access roads that would be used by Mountain Valley during operation of the Project cross wetlands. Access road PA-RO-082 is an existing access road that is 161 feet in length. During operation of the Project, Mountain Valley would use this road to access the Dan River Interconnect and MLV-4. Access road PA-RO-000 is also an existing road that is 4,956 feet in length and would be used to access the LN 3600 Interconnect. No permanent impacts on wetlands from PA-RO-082 or PA-RO-000 are anticipated as no improvements would occur within the wetlands crossed by the access roads. No impacts on wetlands would occur during construction or operation at the proposed contractor yards. Mountain Valley would consult with appropriate federal and state agencies for compensatory mitigation of permanent wetland impacts.

The primary impact of pipeline construction and right-of-way maintenance activities on wetlands would be the temporary, short-term, and long-term alteration of wetland vegetation and permanent conversion of PFO wetlands to PSS or PEM wetlands and of PSS wetlands to PEM wetlands. Effects on wetlands would be greatest during and immediately following construction. Following construction, wetland areas will be seeded with a wetland mix. To control the spread of noxious weed and invasive plant species within temporarily disturbed wetland areas, Mountain Valley will implement their *Exotic and Invasive Plant Species Control Plan*[12], as well as monitor and control occurrences. Additional detail on noxious weeds and invasive plant species can be found in section 4.5.

During construction, failure to segregate topsoil could result in the mixing of topsoil with the subsoil. This could prevent establishment of appropriate species from existing seed bank and alter nutrient availability and soil chemistry, thereby inhibiting recruitment of native wetland vegetation after restoration.

12 Mountain Valley's *Exotic and Invasive Species Control Plan* was included as was included as attachment D in the January 24, 2019 supplemental filing. The *Exotic and Invasive Species Control Plan* can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190124-5165 in the "Numbers: Accession Number" field.

TABLE 4.4-2

Southgate Project Wetland Impacts

State/Facility	Type a/	Crossing Length (feet) b/	Total Wetland Area Affected During Construction (acres) c/	Total Wetland Area Affected During Operation (acres)
Virginia				
Pipeline Facilities d/	PEM	3,561	6.3	0.7
	PSS	362	0.6	0.1
	PFO	2,730	4.5	1.7
Pipeline Facilities Subtotal		*6,653*	*11.4*	*2.5*
Aboveground Facilities	PEM	0	0.0	0.0
	PSS	0	0.0	0.0
	PFO	0	0.02	0.02
Aboveground Facilities Subtotal		*0*	*0.02*	*0.02*
Access Roads	PEM	58	0.0	0.0
	PSS	110	0.1	0.0
	PFO	106	0.1	0.0
Access Roads Subtotal		*274*	*0.2*	*0.0*
Contractor Yards	PEM	0	0.0	0.0
	PSS	0	0.0	0.0
	PFO	0	0.0	0.0
Contractor Yards Subtotal		*0*	0.0	0.0
Virginia Subtotal		6,927	*11.7*	*2.5*
North Carolina				
Pipeline Facilities	PEM	2,424	6.7	0.5
	PSS	245	0.5	0.1
	PFO	4,051	7.2	2.7
Pipeline Facilities Subtotal		*6,720*	*14.4*	*3.3*
Aboveground Facilities	PEM	0	0.5	0.0
	PSS	0	0.0	0.0
	PFO	0	0.2	0.0
Aboveground Facilities Subtotal		*0*	*0.7*	*0.0*
Access Roads	PEM	14	0.1	0.0
	PSS	0	0.0	0.0
	PFO	0	0.0	0.0
Access Roads Subtotal		*14*	*0.1*	*0.0*
Contractor Yards	PEM	0	0.0	0.0
	PSS	0	0.0	0.0
	PFO	0	0.0	0.0
Contractor Yards Subtotal		*0*	0.0	0.0
North Carolina Subtotal		*6,734*	*15.2*	*3.3*
Southgate Total		**13,661**	**26.8**	**5.9**

TABLE 4.4-2

Southgate Project Wetland Impacts

State/Facility	Type a/	Crossing Length (feet) b/	Total Wetland Area Affected During Construction (acres) c/	Total Wetland Area Affected During Operation (acres)

Notes: N/A – Not Applicable; Totals may not sum correctly due to rounding.

a/ PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forested (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.

d/ Pipeline facilities include the permanent right-of-way, temporary workspace, and additional temporary workspace.

Other impacts associated with construction of the Project could include local, temporary changes in wetland hydrology and water quality. Increases in turbidity would likely occur during trenching within ponded wetlands, and could potentially be caused by erosion and sediment-laden stormwater runoff from nearby disturbed areas. Temporary removal of wetland vegetation during construction could alter the capacity of wetlands to function as habitat and as erosion control buffers. Heavy equipment operating during construction could result in soil compaction or rutting that would alter water infiltration, hydrology, and potentially inhibiting germination of seeds and the ability of plants to develop root systems. Additionally, discharges from stormwater, dewatering structures, or hydrostatic testing could transport sediments and pollutants into wetlands, affecting water quality.

The effect of the Project on PEM wetlands would be short-term because the emergent vegetation would regenerate quickly, typically within 1 to 3 years. Following revegetation, permanent impacts on PEM wetlands within the right-of-way would be minimal because these areas consist of and would be maintained as open and herbaceous communities. The duration of the impact on PSS and PFO wetlands would be longer term or permanent. Woody vegetation may take several decades for maturation. Vegetation maintenance over the pipeline, would permanently convert it to PEM wetlands. As a result, the Project would convert 4.4 acres of PFO wetlands and 0.1 acre of PSS wetlands to non-forested wetlands during operation. The conversion from one vegetation cover type to another could result in changes in wetland functions and values. In general, affected wetlands would continue to provide important ecological functions such as sediment/toxicant retention, nutrient removal and transformation, flood attenuation, groundwater recharge/discharge, and wildlife habitat. The PFO and PSS wetlands within temporary construction work areas would be allowed to revert to pre-construction conditions following construction; however, due to the time required for these wetlands to regenerate, impacts would be considered long-term.

Mountain Valley is consulting with the COE and would develop a Compensatory Mitigation Plan to offset permanent wetland impacts, including those that would convert PFO to PEM or PSS wetlands as discussed in section 4.4.4.

Mountain Valley proposes to use the HDD method to install the mainline beneath two wetlands (W-B18-36 and W-B18-39) near MP 30.3 in conjunction with the Dan River crossing. Use of the HDD method would reduce mechanical clearing, and eliminate the need for trenching and operating heavy construction equipment within these wetlands. Mountain Valley would conduct limited hand clearing at this location to create a 3-foot-wide footpath for personnel to lay an HDD guide wire between the entry and exit points.

Federal and state agencies require "sequencing" when proposing a project that may affect wetlands. Sequencing involves three steps. First, wetlands must be avoided to the maximum extent practicable. Second, if avoidance is not an option, impacts must be minimized to the maximum extent practicable. Third, if wetland impacts are unavoidable, wetland replacement or compensatory mitigation is required via the CWA to replace lost wetland functions and values.

Mountain Valley routed its respective pipelines and sited its associated aboveground facilities to avoid wetlands to the maximum extent practicable. As discussed in sections 3.4 and 3.5, we reviewed several potential route alternatives and variations to Mountain Valley's proposal, in response to input from FERC staff, affected landowners, agencies, and other stakeholders to avoid or minimize impacts on environmental resources including, in many cases, wetlands. Based on the proposed and recommended pipeline routes and configuration of aboveground facilities, we have determined that wetland impacts have been avoided to the maximum extent practicable.

Where wetland impacts could not be avoided, Mountain Valley would implement specialized wetland construction procedures within wetlands as described in Mountain Valley's Procedures and section 2.4.1.11. Additional wetland protection measures include, but are not limited to:

- using one traffic lane for construction equipment in non-saturated wetlands;
- using low ground pressure equipment or equipment/timber mats to prevent rutting or soil mixing;
- storing all hazardous materials, including fuels, chemicals, and lubricating fluids, a minimum of 100 feet from any wetland boundary;
- prohibiting parking or refueling of vehicles within 100 feet of a wetland unless the on-site EI determines that there is no practicable alternative and secondary containment structures are used;
- restoring pre-construction contours to maintain the original wetland hydrology; and
- prohibiting the use of herbicides or pesticides within 100 feet of wetlands or waterbodies except as specified by the appropriate land management or state agency.

Following construction, Mountain Valley would ensure that all disturbed wetland areas are successfully revegetated. Along with any additional agency permit requirements, we would not consider revegetation successful until:

- the affected wetland satisfies the current federal definition for a wetland;

- vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;
- the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and
- invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

In accordance with Mountain Valley's Procedures, Mountain Valley would conduct routine wetland monitoring for a minimum of three years to assess the success of wetland revegetation. As applicable, specific monitoring requirements required by other permitting agencies would also be implemented. Three years after construction (or sooner if determined to be successful), Mountain Valley would file a report with the Secretary identifying the status of wetland revegetation efforts and documenting success as defined above. Where revegetation is not successful at the end of three years, Mountain Valley would develop and implement remedial revegetation plans, in consultation with a professional wetland ecologist, to actively revegetate any unrestored wetland and continue revegetation efforts and file annual reports until wetland revegetation is deemed successful by the appropriate state and federal agencies.

4.4.3 Extra Workspaces Within 50 Feet of Wetlands

The FERC Procedures specify that all extra work areas should be set back at least 50 feet from wetlands. Mountain Valley has proposed ATWS at 23 locations within 50 feet of a wetland boundary. Appendix B.3 provides the locations where Mountain Valley proposes less than a 50-foot setback from a wetland and the site-specific rationale for the requested modification from our Procedures. We have reviewed these ATWS locations and find them acceptable.

4.4.4 Compensatory Mitigation

In accordance with Mountain Valley's Procedures and the CWA Section 404(b)(1) Guidelines, Mountain Valley would avoid wetlands along the proposed pipeline whenever possible. Where impacts on wetlands cannot be avoided, the COE requires mitigation to replace the loss of wetland functions and values.

As discussed in section 4.4.2, construction and operation of the Project would permanently convert 4.4 acres of PFO wetlands and 0.1 acre of PSS wetlands to other wetland types. As part of the Section 404 CWA permitting process, Mountain Valley may be required to develop a Compensatory Mitigation Plan to mitigate unavoidable wetland impacts. The *Compensatory Mitigation Plan* would be subject to review and approval by the District Engineer for the COE, Norfolk District in Virginia and Wilmington District in North Carolina. Mitigation amounts may change as field surveys are completed; Mountain Valley would submit any changes in mitigation to the COE for approval.

Mountain Valley submitted a *Compensatory Mitigation Plan* to the COE in November 2018. The COE is still reviewing Mountain Valley's plan and will continue to work with Mountain Valley to determine the appropriate type and amount of mitigation needed for Mountain Valley's wetland impacts in Virginia and North Carolina. For unavoidable wetland impacts in Virginia and North Carolina, Mountain Valley plans to purchase wetland and stream credits from approved mitigation banks in the respective states. The in-lieu fee program may also be considered in Virginia. Mountain Valley would provide proof of compensatory mitigation credit purchase to the COE prior to construction.

According to Mountain Valley's filing on June 21, 2019, there are 75 wetlands (5.9 acres) with permanent impacts requiring mitigation, 22 in Virginia (2.5 acres) and 53 in North Carolina (3.4 acres). The operational easement would permanently affect these wetlands, and these are addressed in Mountain Valley's wetland permit applications to the COE districts. Appendix B.6 lists these wetlands.

4.4.5 Wetlands Conclusions

Permanent impacts on wetlands would include the conversion of forested wetlands to scrub-shrub or emergent wetlands within the pipeline permanent easement. While minor adverse and long-term effects on wetlands would occur, with adherence to Mountain Valley's Procedures and implementation of BMPs, we conclude that construction and operation of the Project would result in minor impacts on wetlands that would be appropriately mitigated and reduced to less than significant levels. In addition, the COE could require Mountain Valley to offset unavoidable impacts on wetlands through the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands through implementation of an agency-approved *Compensatory Mitigation Plan*.

4.5 VEGETATION

4.5.1 Existing Vegetation Conditions

Ecoregions are areas that have similar environmental resources and characteristics, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology (EPA, 2013). These characteristics provide a useful means for classifying and describing vegetation resources within the Project area. The Project is located wholly within the Piedmont Region, sitting between the Appalachian Mountains and the Atlantic coastal plain and stretching from New Jersey in the north to central Alabama in the south. The Project area has been heavily used as cropland; however, many of these areas have regrown into successional forests.

Vegetation community types in the Project area were classified based on a review of aerial photography, existing land use classifications, and field surveys. Managed or developed land classes include agricultural land, commercial, industrial, and residential areas and represent about 21 percent of the proposed land that would be required for the Project. Of the approximately 94 percent of vegetated areas within the Project footprint[13], the majority (about 49 percent) consists of forested upland, followed by herbaceous/scrub-shrub upland (about 35 percent); less than 2 percent of the pipeline Project area is within wetland vegetation communities. Wetlands crossed by the Project are discussed in section 4.4.

The Project would cross through three major natural upland vegetation cover types: agricultural land, forested land, herbaceous/scrub-shrub as shown in table 4.5-1. Common species observed within the construction and operational workspace are included in the table below.

TABLE 4.5-1

Upland Vegetation Cover Types Associated with the Southgate Project

Class Name	Description	Construction (acres)	Operation (acres)
Agricultural	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops. Also includes active cropland, orchards, vineyards, or hay fields.	196.2	67.5
Upland Forest	Non-wetland forested and woodland communities supporting a dominance of tree cover. Representative species include: red oak (*Quercus rubrum),* white oak (*Quercus alba)*, willow oak (*Quercus phellos),* American beech (*Fagus grandifolia)*, red maple (*Acer rubrum*), and evergreen trees such as pitch pine (*Pinus rigida)*, Virginia pine (*Pinus virginiana),* and Loblolly pine (*Pinus taeda)*.	603.0	237.2

13 Vegetated areas noted here include agriculture and silviculture lands, which are also included in the managed or developed land classes percentage provided above; agriculture and silviculture lands account for approximately 15 percent of the total Project acreages.

TABLE 4.5-1

Upland Vegetation Cover Types Associated with the Southgate Project

Class Name	Description	Construction (acres)	Operation (acres)
Upland Herbaceous/ Scrub-Shrub	Non-wetland native grasslands or areas of shrubs less than 15 feet tall. Herbaceous vegetation is usually greater than 80 percent of total vegetation and can be used for grazing, but not intensely managed. Dominant herbaceous species included: orchard grass (*Dactylis glomerata)*, red fescue (*Festuca rubra)*, common velvet grass (*Holcus lanatus)*, Japanese stilt-grass (*Microstegium vimineum)*, Kentucky blue grass (*Poa pratensis)*, meadow false rye grass (*Schedonorus pratensis)*, white clover (*Trifolium repens)*, wingstem (*Verbesina alternifolia)*, giant ironweed (*Veronia gigantea)*, and reed canary grass (*Phalaris arundinacea)*. Dominant scrub-shrub species included Allegheny blackberry (*Rubus allegheniensis)*, dogwoods (*Cornus spp.)*, willows (*Salix spp.)*, spicebush (*Lindera benzoin)*, blueberry (*Vaccinium spp.)*, and black elder (*Sambucus nigra)*.	612.5	128.8

4.5.2 Vegetation Communities of Special Concern or Value

Mountain Valley consulted with federal and state resource agencies to identify sensitive or protected vegetation types, natural areas, and unique plant communities in the Project area. The FWS identified two federally listed plant species potentially occurring in the Project area in North Carolina; small whorled pogonia (*Isotria medeoloides)* and smooth coneflower (*Echinacea laevigata)*. The small whorled pogonia can be found in hardwood and conifer-hardwood forests, in leaf litter along small intermittent streams. Smooth coneflower is also rare. Its current range is limited to within the states of Virginia, North Carolina, South Carolina, and Georgia. These species are discussed further in section 4.7.

The Virginia Department of Conservation and Recreation, Division of Natural Heritage (VADCR-DNH) identified three species of rare plants that have historically occurred near the Project area: American blueheart (*Buchnera americana)*, Downy phlox (*Phlox pilosa)*, and Piedmont Barbara's-button (*Marshallia obovata)*. The North Carolina Natural Heritage Program (NCNHP) identified one state-listed rare plant species, cliff stonecrop (*Sedum glaucophyllum)*, known to occur in Rockingham County. In Virginia, species classified as rare do not have any legal status and are not afforded state protections. Similarly, in North Carolina, the NCWRC requires monitoring of species of special concern but there is no legal protection from take for these species. We discuss potential Project impacts on these species in section 4.7.2.

The NCNHP identified the Dry-Mesic Oak-Hickory Forest and Mesic Mixed Hardwood Forest communities near the Project area, which may contain sensitive and/or protected species. However, these communities were found either outside the Project area or already disturbed. Impacts on these forest communities would also be minimized due to collocation with an existing right-of-way. Mountain Valley would minimize impacts on forest habitat through adherence to

FERC's Plan and Mountain Valley's Procedures. We discuss potential Project impacts on sensitive and/or protected species in section 4.7.

4.5.3 Noxious Weeds and Invasive Plant Species

Invasive species are those that display rapid growth and spread, becoming established over large areas (USDA, 2017). Most commonly, they are exotic species that have been introduced from another part of the United States, another region, or another continent, although some native species that exhibit rapid growth and spread are also considered invasive. Invasive plant species can change or degrade natural vegetation communities, which can reduce the quality of habitat for wildlife and native plant species. Similar to invasive species, noxious weeds are frequently introduced but are occasionally native. Noxious weeds are defined as those that are injurious to commercial crops, livestock, or natural habitats and typically grow aggressively in the absence of natural controls (USDA, 2017). Clearing and excavation associated with construction of the Project would expose the topsoil to exotic or invasive species seeds and increase the potential for their introduction or spread along the right-of-way.

Mountain Valley used the VADCR-DNH Virginia Invasive Plant Species List and the North Carolina Invasive Plant Council List (Virginia Invasive Species Council, 2005; North Carolina Invasive Plant Council, 2016) to identify possible invasive plant species that could occur in the Project area. Mountain Valley documented noxious weeds on accessible tracts during field surveys conducted in 2018. To date, Mountain Valley has completed surveys along approximately 92 percent of the Project workspace. Mountain Valley documented exotic or invasive species in most of their surveys conducted in Virginia and North Carolina. The most common exotic or invasive species documented in Virginia included Japanese honeysuckle, Chinese lespedeza, Japanese stilt-grass, Chinese privet, tree of heaven, multiflora rose, spotted knapweed, and Johnson grass. The most common exotic or invasive species documented in North Carolina included Japanese honeysuckle, Japanese stilt-grass, multiflora rose, Chinese privet, and tree of heaven.

4.5.4 Impacts and Mitigation

Table 4.5-2 lists the amount of vegetation cover types that would be affected by construction and operation of the proposed Project. Construction of the Project, including the construction right-of-way, ATWS, aboveground facilities, contractor yards, and access roads would affect 1,438.8 acres of vegetated lands. This would include agricultural land (14 percent), upland herbaceous/scrub-shrub (43 percent), PEM and PSS wetlands (1 percent), upland forested land (42 percent), and forested wetland (less than 1 percent). Following construction, vegetation in temporary construction areas would be allowed to revert to pre-construction vegetation conditions. Of the 1,438.8 acres of vegetation affected during construction of the Project, 439.6 acres (31 percent) would be affected by the operation of the Project, including routine mowing in the maintained pipeline rights-of-way, conversion of vegetation within the aboveground facility sites, and permanent access roads. Vegetation cover types that would be affected by operation of the Project include agricultural land (15 percent), upland herbaceous/scrub-shrub (29 percent), PEM and PSS wetlands (less than 1 percent), upland forested land (54 percent), and forested wetland (1 percent). We discuss impacts on wetlands further in section 4.4.

Tree clearing within temporary construction work areas is considered a long-term, permanent impact because it may take several decades for these areas to resemble the forest vegetation that was present before construction. See section 4.8 for additional information on land use impacts.

We received comments regarding the effects of tree removal on air quality, impacts on large and old (100-year-old) trees, and the potential for mitigation to compensate for the removal of trees. Construction could result in the removal of large and older individual trees that have intrinsic aesthetic value and may currently provide a visual barrier for residential areas. Mountain Valley would follow measures outlined in the FERC Plan, which requires that they avoid removal of mature trees and landscaping within residential areas unless necessary for safe operation of construction equipment, or as specified in landowner agreements. An easement agreement between a company and a landowner would typically negotiate and specify compensation for losses resulting from construction, including losses of decorative and ornamental trees. In general, removal of trees would result in the loss of carbon sequestration capacity since forest habitat would be permanently removed and converted to herbaceous right-of-way; however, in temporary workspaces, over time, arboreal vegetation will regenerate and provide carbon sequestration. Since forested areas are common and well represented throughout the region and in the immediate vicinity of the Project, we anticipate a very minor loss of carbon sequestration capacity, and impacts on air quality, if any, should be indiscernible. Further discussion of impacts on air quality are discussed in section 4.11.

We received a comment from the Roanoke River Basin Association (RRBA), which suggested mitigation for tree removal at a 5:1 ratio to offset the GHG effects of pipe leakage. The RRBA estimated that five new trees should be planted for every tree removed for construction of the pipeline right-of-way. Their estimate is based on their findings of 1% leakage rates of methane gas from other pipelines. RRBA states that methane is 25 times stronger than carbon dioxide in its effect as a greenhouse gas, and while it would be better to eliminate pipe leakage, the leakage should be offset with tree mitigation until the pipe leakage can be eliminated. We note that Virginia has 15.72 million acres of forestland (Virginia Department of Forestry [VADOF]) and North Carolina has 18.8 million acres of forests (North Carolina Forestry Association [NCFA]). Within this context, we conclude that impacts on forests would be long-term but would not be significant.

TABLE 4.5-2

Vegetation Communities Affected by Construction and Operation of the Southgate Project f/ g/

Facility County, State	Agricultural Land a/		Upland Forest b/		Upland Herbaceous / Scrub-shrub c/		Herbaceous / Scrub-Shrub Wetland d/		Forested Wetland d/		Total Vegetation Acreage e/	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
VIRGINIA												
H-605 Pipeline Right-of-Way h/	1.0	0.6	3.5	1.7	0.7	0.4	0.0	0.0	0.0	0.0	5.2	2.7
H-650 Pipeline Right-of-Way h/	51.7	25.9	138.5	69.4	96.8	48.7	6.9	0.8	4.7	1.9	298.6	146.7
Additional Temporary Workspace i/	15.4	0.0	45.4	0.0	30.9	0.0	0.0	0.0	0.2	0.0	92.0	0.0
Cathodic Protection Groundbeds	0.0	0.0	0.5	0.5	3.0	3.0	0.0	0.0	0.0	0.0	3.5	3.5
Permanent Aboveground Facilities												
Lambert Compressor Station & Interconnect / MLV 1	12.7	6.3	5.1	4.4	1.3	1.0	0.0	0.0	0.0	0.0	19.0	11.7
Contractor Yards	0.0	0.0	3.0	0.0	85.6	0.0	0.0	0.0	0.0	0.0	88.6	0.0
Temporary and Permanent Access Roads h/	4.1	0.7	5.3	0.2	20.3	1.0	0.1	0.0	0.1	0.0	29.8	2.0
Virginia Subtotal e/	**84.9**	**33.5**	**201.3**	**76.2**	**238.6**	**54.1**	**7.0**	**0.8**	**5.0**	**1.9**	**536.7**	**166.6**
NORTH CAROLINA												
H-650 Pipeline Right-of-Way h/	67.0	33.9	306.8	160.6	142.5	69.3	5.7	0.6	6.4	2.7	528.5	267.0
Additional Temporary Workspace i/	38.4	0.0	86.7	0.0	54.8	0.0	1.5	0.0	0.9	0.0	182.3	0.0

TABLE 4.5-2

Vegetation Communities Affected by Construction and Operation of the Southgate Project f/ g/

Facility County, State	Agricultural Land a/		Upland Forest b/		Upland Herbaceous / Scrub-shrub c/		Herbaceous / Scrub-Shrub Wetland d/		Forested Wetland d/		Total Vegetation Acreage e/	
	Const	**Oper**	**Const**	**Oper**	**Const**	**Oper**	**Const**	**Oper**	**Const**	**Oper**	**Const**	**Oper**
Cathodic Protection Groundbeds	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.6	0.6
Permanent Aboveground Facilities												
LN 3600 Interconnect	0.0	0.0	0.3	0.2	4.4	0.6	0.0	0.0	0.0	0.0	4.7	0.8
T-15 Dan River Interconnect / MLV 4	0.1	0.0	0.0	0.0	4.6	0.8	0.5	0.0	0.0	0.0	5.2	0.8
T-21 Haw River Interconnect / MLV 8	0.0	0.0	0.0	0.0	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6
Contractor Yards	0.0	0.0	0.5	0.0	130.5	0.0	0.0	0.0	0.0	0.0	131.0	0.0
Temporary and Permanent Access Roads h/	5.7	0.0	7.5	0.1	35.2	3.1	0.0	0.0	0.0	0.0	48.4	3.2
North Carolina Subtotal e/	**111.2**	**33.9**	**401.8**	**160.9**	**374.0**	**75.0**	**7.7**	**0.6**	**7.3**	**2.7**	**902.0**	**273.1**
Vegetation Acres Total e/	**196.1**	**67.4**	**603.1**	**237.1**	**612.6**	**129.1**	**14.7**	**1.4**	**12.3**	**4.6**	**1,438.8**	**439.6**

Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect); therefore, acreage calculations for the pig launchers and receivers are included with those facilities. Mainline valves (MLVs) 1, 4, and 8 will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect); therefore, acreage calculations for MLVs 1, 4, and 8 are included with those facilities.

a/ Cultivated land (e.g., tobacco, soybeans, hay, corn).

b/ Upland forest and wooded lands, including those being managed for forest products (i.e., silviculture).

c/ Utility rights-of-way, grasslands, open fields, vacant land, herbaceous and scrub uplands, non-forested lands, golf courses, and municipal land.

d/ Palustrine emergent, palustrine scrub-shrub and palustrine forested wetlands as identified from field delineations where access is available and NWI where survey access not available (see section 4.4.2)

TABLE 4.5-2

Vegetation Communities Affected by Construction and Operation of the Southgate Project f/ g/

Facility County, State	Agricultural Land a/		Upland Forest b/		Upland Herbaceous / Scrub-shrub c/		Herbaceous / Scrub-Shrub Wetland d/		Forested Wetland d/		Total Vegetation Acreage e/	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper

e/ Sums of addends may not equal totals due to rounding.

f/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points are not included in this acreage. Acreage includes a three-foot path between the HDD entry and exit workspace areas to allow for placement of the HDD guide wire.

g/ Includes only the operation footprint of the Project facilities, the 50-foot-wide permanent pipeline right-of-way in uplands, except in wetland areas where the operation width has been reduced to 10 feet in emergent wetlands, scrub-shrub wetlands, and within 25 feet of waterbodies;and 30 feet in forested wetlands. The 50-foot-wide permanent right-of-way between horizontal directional drill entry and exit points and within railroad rights-of-way are not included in this acreage.

h/ Includes the 50-foot-wide permanent right-of-way and temporary workspace areas.

i/ Includes ATWS areas for both the H-605 and H-650 pipelines. ATWS areas to be used for construction of aboveground facilities are included in the acreage calculations for the applicable aboveground facilities.

4.5.4.1 Pipeline Facilities

The extent of impacts on vegetation from the pipeline construction would vary depending on the type of vegetation affected and the area and frequency of vegetation maintenance conducted during operation. The primary effect of pipeline construction would be cutting, clearing, and/or removing 1,106.4 acres of existing vegetation, of which 580.8 acres would be forested uplands. The remaining vegetation would include 173.6 acres of agricultural lands, 325.7 acres of upland herbaceous/scrub-shrub and 26.3 acres of wetlands (including 12.2 acres of forested wetlands and 14.1 acres of non-forested wetlands). Secondary impacts associated with disturbances to vegetation could include increased soil compaction and erosion, increased soil temperature and dryness, increased potential for the introduction and establishment of non-native and invasive species, and physical damage to nearby trees. See section 4.4 for a discussion of mitigation measures for impacts on wetlands.

Clearing activities would include the removal of vegetation within the proposed construction workspace by mechanical or hand cutting methods. During clearing activities, Mountain Valley would cut down brush and trees into the construction area to minimize damage to trees and structures adjacent to the workspace, and would take care to avoid damaging adjacent tree limbs and feeder roots. Mountain Valley would conduct selective side-trimming on trees adjacent to the construction area where necessary for safety. Stumps would be cut as low to the ground as possible. Stumps would be removed along the trench line, and selectively in other construction areas to allow for the safe installation of the pipeline.

Mountain Valley states that merchantable timber would be cut to useable lengths and stacked on the edge of the right-of-way to a maximum height of 4 feet with openings every 200 feet to allow the safe passage of wildlife. Typically, cut timber would be disposed in accordance with landowner wishes; unless Mountain Valley purchases the timber as part of its compensation agreements. Mountain Valley further states that brush cleared from the construction corridor would be open burned, windrowed, chipped/mulched, or hauled off for disposal at an approved location. According to Mountain Valley, chipped brush would be blown off of the right-of-way with landowner approval. Chips would not be blown into environmentally sensitive areas (i.e., waterbodies, wetlands, and habitat for special status species).

Mountain Valley's proposed timber and brush disposal methods do not comply with the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*, section III.E.; specifically in regards to windrowing of timber along on the right-of-way and blowing chipped brush off the right-of-way without being hauled off and used for beneficial reuse by the landowner. Windrowed timber and chipped brush along and off the right-of-way is considered construction debris. Therefore, **we recommend that:**

- **<u>Prior to construction</u>**, **Mountain Valley should file with the Secretary, for review and written approval by the Director of OEP, revised plans to dispose of brush and timber that are in accordance with the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan*, section III.E**.

Topsoil would be segregated during construction within cultivated or rotated agricultural lands, and at the landowner's request in other areas. Impacts on agricultural lands would be temporary to short-term because these areas are disturbed annually to produce crops and would typically return to their previous condition shortly following construction, cleanup, and restoration. Following pipeline installation, topsoil would be returned in order to mitigate impacts on subsequent crop production.

Construction in herbaceous and scrub-shrub uplands would remove the vegetative ground cover over the entire width of the construction right-of-way. Lands currently dominated by herbaceous growth would revegetate quickly, often within one growing season after seeding and otherwise typically within 3 years. Areas of scrub-shrub vegetation would likely require 3 to 5 years to regain its woody composition.

The majority of vegetation affected by construction of the Project would be upland forested land, which would result in long-term impacts. Construction in forested uplands would remove the tree canopy over the entire width of the construction right-of-way, which would change the structure and environment of the underlying and adjacent areas. Forested uplands within the maintained right-of-way, including areas of silviculture and tree farms, would be permanently converted to an herbaceous cover type. Lands adjacent to the right-of-way would remain forested; however, they could experience reduced habitat value compared to pre-construction conditions. The creation of edge habitat could increase the risk of invasive species and other impacts on wildlife species. The regrowth of shrubs and trees within the temporary workspaces would reduce the edge effect and provide connectivity between adjacent forested tracts to some extent (Tewksbury et al., 2002).

Soils that were previously shaded by the tree canopy would receive increased amounts of light, which could lead to drier soils and higher soil temperatures until vegetation returns. Trees on the edge of the right-of-way might be subject to mechanical damage and roots could be affected by soil disturbance and compaction, all of which could result in the decreased health and viability of some trees and root systems. Some edge trees that were previously within dense forested stands may also lack stability following removal of adjacent supporting trees, which could result in increased susceptibility to wind damage.

Following construction, Mountain Valley would seed the construction workspace and allow natural succession to revegetate workspaces disturbed by construction in accordance with FERC's Plan and Mountain Valley's Procedures. Mountain Valley would use and apply a seed mix that incorporates recommendations from the local soil conservation authority, the landowner, or land management agency, including:

- using a native seed mixture with specific varieties based on specific sites and area of adaptation;
- applying seed at suggested rates;
- applying seed within the recommended seeding dates; and
- providing appropriate temporary erosion control measures when seeding cannot be implemented within the recommended seeding dates.

To control the spread of noxious weed species within the Project area, Mountain Valley developed an *Exotic and Invasive Plant Species Control Plan*[14] in coordination with VADCR[15] and NCNHP[16], which includes implementation of the following measures:

- thoroughly clean all construction equipment prior to mobilization to the Project construction area and when moving between construction spreads that may have different concentrations of exotic or invasive species presence;
- store segregated topsoil from portions of the right-of-way known to contain exotic or invasive species separate from less contaminated topsoils;
- use weed-free mulch (i.e., straw, hay, or other erosion control materials) during construction, sediment erosion control, and restoration efforts;
- monitor the right-of-way during and after construction for exotic or invasive species infestations or spread; and
- promptly reseed all disturbed areas after final grading is completed using native species within seed mixes in consideration of recommendations from local soil conservation authorities.

Once construction is complete, Mountain Valley would monitor and control occurrences of noxious and invasive weed species throughout restoration and for 2 years following restoration in locations along the route where infestations were not identified prior to construction. Mountain Valley would determine control measures for infestations in consultation with the VADCR and NCNHP. These measures could include the use of non-persistent and biodegradable herbicides, applied by locally certified personnel.

In accordance with FERC's Plan and Mountain Valley's Procedures, Mountain Valley would conduct follow-up inspections of all disturbed areas to determine the success of revegetation. FERC inspectors would also complete inspections on a monthly basis to determine compliance with FERC's Plan and Mountain Valley's Procedures, and to ensure certificate conditions are being met. Revegetation in non-agricultural areas would be considered successful when the density and cover of non-nuisance vegetation are similar to adjacent, undisturbed lands. In agricultural areas, revegetation would be considered successful when, upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field unless otherwise specified in the easement agreement. Mountain Valley would file with the Secretary quarterly activity reports documenting the results of revegetation for at least 2 years following construction.

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[14] Mountain Valley's *Exotic and Invasive Species Control Plan* was included as was included as attachment D in the January 24, 2019 supplemental filing. The *Exotic and Invasive Species Control Plan* can be viewed on the FERC website at http://www.ferc.gov/. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190124-5165 in the "Numbers: Accession Number" field.

[15] Virginia DCR Guidance for invasive species control measures is available at: https://www.dcr.virginia.gov/natural-heritage/factsheets#invasives.

[16] Invasive Exotic Plants of North Carolina (published by North Carolina Department of Transportation) includes the control for invasive plants in the state and is available at: https://connect.ncdot.gov/resources/Environmental/Compliance%20Guides%20and%20Procedures/Invasive_Exotic_Plants_Manual_May_2012.pdf.

Mountain Valley would mow or clear vegetation within the operational right-of-way every 3 years. However, Mountain Valley proposes to maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys.

4.5.4.2 Aboveground Facilities, Contractor Yards, and Access Roads

Construction of the proposed aboveground facilities would disturb about 34.4 acres of vegetation including 12.8 acres of agricultural land, 15.1 acres of upland herbaceous/scrub-shrub, 5.9 acres of forested uplands, and 0.5 acre of wetlands. Following construction, 6.3 acres of agricultural land, 6.4 acres of upland herbaceous/scrub-shrub, and 5.1 acres of forested uplands would be permanently converted to developed land for operation of the aboveground facilities. The remaining 16.6 acres of construction workspace would be stabilized, seeded, and allowed to revegetate in accordance with FERC's Plan and Mountain Valley's Procedures.

Construction of the Project access roads and contractor yards would disturb about 297.8 acres of vegetation. The open uplands affected during construction would be allowed to revert back to pre-construction conditions. The majority of the access roads are existing roads including paved roads and access ways, gravel roads, and unimproved dirt roads. Tree trimming would be selectively conducted along the existing access roads, as necessary. Twenty-two access roads would be retained for operation of the Project and would result in the permanent conversion of about 5.1 acres of vegetation, including 0.7 acre of agricultural land, 4.0 acres of upland herbaceous/scrub-shrub, and 0.4 acre of forested upland.

4.5.4.3 Interior Forest

Interior forest is defined as forested areas greater than 300 feet from the influence of forest edges or open habitat (Jones et al., 2001), and it provides habitat for a variety of wildlife and plant species, including food resources, brooding habitat for wildlife, and protection from disturbance and predation.

Interior Forest Fragmentation and Edge Effects

Interior forests were assessed by Mountain Valley using aerial imagery of the Project area taken in April 2018. Constructing the Project would create a new, cleared corridor in areas of interior forest where the rights-of-way would not be collocated with existing linear corridors. Clearing or fragmentation of interior forests creates more edge habitat and smaller forested tracts, which can impact characteristics of vegetation communities including their suitability for wildlife.

The term "edge effect" is commonly used in conjunction with the boundary between natural habitats, such as interior forest, and disturbed or developed land, such as pipeline corridors. Clearings adjacent to forested areas increase sunlight and wind within the forest, which can cause trees to become less healthy due to increased wind shear, drying out the interior of the forest close to the edge, and changes in air temperature, soil moisture, and light intensity. These changes can in turn encourage growth of opportunistic species, including non-native invasive species, that may displace species more acclimated to non-edge habitat (Murcia, 1995). Fragmentation of forested areas can result in the loss of high habitat value interior forest and the plant and animal species associated with that habitat. Conversely, forest edges also play a key role in ecosystem functions, including the dispersal of plants and wildlife, the spreading of fire, as corridors for wildlife movements, and in shaping vegetation composition and structure. The edge and newly cleared areas, as they begin to revegetate, would generally support herbaceous and shrub species, including various species of berries, which are productive habitat for the species that exploit these conditions.

The landscape along the route of the Project is generally fragmented by existing roads, utility rights-of-way, residential and commercial development, pastures, and agriculture. In areas where the Project is collocated with existing corridors and development, new fragmentation would not occur.

Construction of the Project would impact 52.6 acres of interior forest (includes 0.6 acre of forested wetland) and 578 acres of forested edge (includes 10.4 acres of forested wetland). Operation of the Project would permanently affect 19.6 acres of interior forest (includes 0.2 acres of forested wetland) and 211.8 acres of forested edge (includes 3.9 acres of forested wetland).

In addition to these direct impacts, clearing of interior forest would also result in indirect effects to intact forest along the edges of the new corridor. Harper et al. (2005) reported that the mean distance of edge influence could occur up to 300 feet (approximately 100 meters). However, the study found that the mean distance of edge effects from “maintained” edges, where the non-forested community is maintained, such as a pipeline right-of-way, secondary responses often result in the development of a “sidewall” of dense vegetation. This may reduce the depth of penetration of energy and matter into the forest, shortening the length of the gradient (distance) while the magnitude of edge influence remains strong (Harper et al. 2005). In general, the greater distances were not found in the North American sites reviewed by Harper, where the influence associated with maintained clearings was less than 150 feet.

To minimize forest fragmentation and edge effects, Mountain Valley has collocated about 54 percent (40 miles) of the pipeline route with existing linear corridors. Mountain Valley would minimize impacts with the implementation of FERC’s Plan and Project-specific E&SC Plan (see section 2.0). Additional discussion of interior forests in relation to habitat for migratory birds is included in section 4.6.

4.5.5 Vegetation Conclusions

Based on our review of the potential impacts on vegetation as described above, we conclude that the primary impact from construction and operation of the Project would be on forested lands. However, given the high level of collocation with existing, maintained rights-of-way through the majority of large forested areas crossed by the proposed pipeline routes, and the extensive distribution of similar vegetation communities in Virginia and North Carolina, we conclude that impacts on vegetation, including forested areas, would be adequately reduced to less than significant levels. In addition, impacts on forested and non-forested vegetation types, as well as the introduction or spread of noxious weeds or invasive plant species, would be further mitigated through adherence to the measures outlined in FERC’s Plan and Mountain Valley’s Procedures, and other mitigation measures described above.

4.6 WILDLIFE AND FISHERIES

4.6.1 Terrestrial Wildlife

The Project is located in the Piedmont Region of south-central Virginia and northcentral North Carolina and contains diverse wildlife habitats suitable for commonly found large and small mammals, reptiles and amphibians, and birds (raptors, waterfowl, and songbirds) of the region. Federal and state special status species (i.e., endangered, threatened, and species of concern) are described in section 4.7.

Wildlife is generally dependent on available habitat, which is typically directly linked to existing vegetation cover types. As described in sections 4.3.3, 4.4, and in the sections below, the Project would cross several upland and wetland vegetation cover types. These include forested, scrub-shrub, and herbaceous uplands; and herbaceous, scrub-shrub, and forested wetlands.

Table 4.6-1 identifies the terrestrial wildlife species commonly associated with the vegetation cover types that would be crossed by the Project.

TABLE 4.6-1

Wildlife Species Commonly Associated with Vegetation Communities Affected by the Southgate Project

Habitat Type	Wildlife Species
Upland Forest	***Mammals:*** *Big Brown Bat, Bobcat, Eastern Chipmunk, Eastern Gray Squirrel, Fox Squirrel, Eastern Red Bat, Gray Fox, Red Fox, Striped Skunk, White-Tailed Deer;* ***Birds:*** *Acadian Flycatcher, Barred Owl, Black-And-White Warbler, Blue Jay, Blue-Headed Vireo, Common Raven, Great Horned Owl, Hooded Warbler, Ovenbird, Pileated Woodpecker, Red-Bellied Woodpecker, Red-Shouldered Hawk, Scarlet Tanager, Wild Turkey;* ***Herpetofauna:*** *Eastern Box Turtle, Northern Copperhead, Spotted Salamander, White-Spotted Slimy Salamander, Wood Frog*
Upland Scrub-Shrub	***Mammals:*** *Eastern Cottontail, Red Fox, White-Footed Mouse, White-Tailed Deer;* ***Birds:*** *Eastern Towhee, Brown Thrasher, Cooper's Hawk, Eastern Screech Owl, Indigo Bunting, Song Sparrow, White-Eyed Vireo, Yellow-Breasted Chat;* ***Herpetofauna:*** *Northern Black Racer, Northern Rough Greensnake*
Upland Herbaceous	***Mammals:*** *Coyote, Groundhog, Meadow Vole, Red Fox, White-Tailed Deer;* ***Birds:*** *Eastern Meadowlark, American Kestrel, Eastern Bluebird, Grasshopper Sparrow, Vesper Sparrow, Wild Turkey;* ***Herpetofauna:*** *Eastern Gartersnake, Northern Brownsnake, Milksnake*
Wetland	***Mammals:*** *American Beaver, Bobcat, Mink, Muskrat, Raccoon, River Otter, Virginia Opossum, White-Tailed Deer;* ***Birds:*** *Common Yellowthroat, Great Blue Heron, Green Heron, Red-Winged Blackbird, Swamp Sparrow, Tree Swallow, Wood Duck;* ***Herpetofauna:*** *Spring Peeper, Bullfrog, Eastern Painted Turtle, Eastern Red-Spotted Newt, Green Frog, Snapping Turtle, Spotted Salamander, Upland Chorus Frog*
Agricultural Land	***Mammals:*** *Deer Mouse, Groundhog, Raccoon, White-Tailed Deer;* ***Birds:*** *Brown-Headed Cowbird, Barn Swallow, Horned Lark, Mourning Dove;* ***Herpetofauna:*** *Eastern Ratsnake. Eastern Gartersnake*

Source: NCWRC, 2018a; VADGIF, 2018

4.6.1.1 Terrestrial Wildlife Impacts and Mitigation

Pipeline Facilities

Upland forest comprises the largest component of the wildlife habitat crossed by the pipeline right-of-way (about 52 percent; actual acreages are provided in table 4.5-1). Three types of upland forest habitat would be affected: deciduous, evergreen, and a mix of deciduous and evergreen. Upland forests contain a wide variety of wildlife species, attributable to the diverse range of habitat types that forests provide, from the overhead canopy of the forest trees to the understory vegetation and forest-floor detritus. Tree and shrub layers provide food and cover for birds and larger mammals, such as white-tailed deer. Forest hardwood species such as oaks, beech, and poplar, produce acorns and seeds, which are important food sources for many bird and mammal species. Fallen trees and limbs give rise to insects, which also serve as important food sources, and the dense leaf litter and other detritus within the understory provide food and cover for invertebrates, amphibians, reptiles, and smaller mammals.

Agricultural lands and herbaceous and scrub-shrub uplands combined comprise the second largest component of wildlife habitat crossed by the Project (about 45 percent). Agricultural land and other non-forested upland habitats, such as idled croplands, hayfields, and old fields and pastures provide nesting, denning, and foraging habitat for grassland birds, upland game birds, and small to large mammals. Utility rights-of-way maintained in early successional communities also provide nesting and foraging habitats for grassland bird species and serve as grazing habitat for deer. These lands are, in turn, also prime hunting grounds for predator species such as foxes, coyotes, and raptors.

Constructing the Project would disturb about 1,439 acres of wildlife habitat, including agricultural lands. The temporary and permanent loss and/or conversion of habitat and the general disturbance created by the use of construction equipment would impact wildlife. This impact would vary depending on the type and quantity of habitat affected and the ability of species to leave Project work areas and successfully utilize adjacent habitats.

Constructing the Project may result in limited mortality of less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates, which may not be able to relocate from the immediate construction area. In addition, during pipeline installation, there is potential for wildlife to be injured by falling into an open trench. Open trenches containing standing water could prove hazardous to smaller, less mobile animals. Mountain Valley would implement the following measures to reduce construction-related injury or mortality of wildlife:

- provide pre-construction training of personnel regarding the potential presence of wildlife within the Project area and protocols for delaying or stopping work should wildlife be present within active workspace areas;
- maintain breaks or gaps in temporary spoil piles and pipe stringing to facilitate wildlife migration through the construction corridor;
- install bi-directional ramps within open trench areas, at intervals of approximately 0.1 mile, to facilitate exiting of the trench by wildlife traveling in either direction;
- inspect workspaces and the trench in active construction areas prior to the start of each construction day to ensure that wildlife is not present; if wildlife is present, construction

activities would be delayed in that area to allow the animals present to move outside of the workspace;

- inspect equipment left within the workspace prior to the start of each construction day to ensure that no wildlife is present within or under the equipment;
- prohibit direct handling of wildlife with the exception of relocation of injured or immobile animals by the environmental inspector(s);
- prohibit direct handling of any state or federally listed rare species unless otherwise approved by the applicable regulatory agencies;
- regulate equipment speed on access roads to minimize the potential for wildlife mortality; and
- require disposal of construction debris according to federal, state, and local regulations, and practice of good housekeeping to prevent garbage from attracting opportunistic wildlife and predators.

We expect that mobile wildlife would relocate to similar adjacent habitats during Project construction. However, displaced wildlife could experience inter- and intra-specific competition, lower reproductive success, and overall increased rates of stress, injury, and mortality if adequate adjacent habitat was not available. Where similar adjacent habitat is present, displacement impacts would generally be short-term. Wildlife would be expected to return and colonize successfully restored habitats that were temporarily affected by construction. Based on our restoration monitoring efforts for other natural gas infrastructure projects, we have found that wetland and upland herbaceous and shrub vegetation typically restore to pre-construction conditions in a relatively short time (i.e., between 1 to 5 years). Therefore, construction impacts on most mobile species occupying these habitats would be temporary.

The impacts on forest-dwelling wildlife species would be greater because forest habitat takes a comparatively longer time to regenerate within the revegetated temporary workspace. Restoring the temporary construction areas to forest habitats similar to that which existed prior to construction could take several decades, depending on-site-specific conditions, such as rainfall, elevation, grazing, and weed introduction. Forest would be permanently removed within the operational right-of-way. The fragmentation of forested habitat and edge effects of maintaining the pipeline rights-of-way through this habitat are further discussed in the following section.

Interior forests and habitat fragmentation are discussed in detail in section 4.5.4.3. The Project would be collocated with existing utility corridors for 52.5 percent (39 miles) of the Project right-of-way. Collocating reduces the amount of fragmentation and new edges by shifting the existing forest edge as opposed to creating a completely new corridor. In Virginia, the Project would permanently impact about 7.7 acres of contiguous interior forest. In North Carolina, the Project would permanently impact about 44.9 acres of contiguous interior forest. In total, the Project would impact about 615.3 acres of forest habitat (including forested wetland) during construction. Removal of forest habitat, including areas of silviculture and tree farms, for the operation of the Project would be permanent. The time needed for forested wildlife habitats to recover within the temporary right-of-way would be long-term. However, the relatively small size of the interior forest habitat blocks that would be affected (an average of 3.1 acres per block) would minimize the amount of interior forest habitat being converted to edge habitat at any one location. Therefore, impacts on wildlife species would not result in long-term or significant population-level effects, given the stability of local populations and the abundance of available habitat outside the proposed right-of-way. We discuss the impacts on migratory birds specifically in section 4.6.4.

Noise generated by the Project is discussed in detail in section 4.11.2.3. 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 and vegetation outside the right-of-way. Wildlife species rely on aural cues for courtship and mating, prey location, predator detection, and/or homing. These functions could be affected by noise resulting from construction and operation of the Project. Specifically, construction noise could lead to nest abandonment, which in turn can lead to egg failure, reduced juvenile growth and survival, or malnutrition or starvation of the young. During construction, the effects of noise on wildlife would be greatest immediately adjacent to the construction right-of-way. As described previously, construction along the right-of-way proceeds through a particular habitat and then moves along to the next one, usually within 6 to 12 weeks. Therefore, construction noise impacts would be temporary.

Blasting along the right-of-way may be necessary during construction where bedrock is present at depths less than the proposed pipeline trench depth (see section 4.1.4.7). Generally, noise levels produced during blasting are instantaneous and vary based on a number of factors, including the type and amount of explosives used, the depth below-ground of the explosives, and whether noise mitigation is applied. Potential impacts of blasting would be similar to those from general construction noise. Typical construction blasting operation noise levels have been documented at about 94 dBA at a distance of 50 feet; whereas construction equipment noise levels would typically be around 85 dBA at 50 feet when the equipment is operating at full load (FHWA, 2006a). Although slightly louder than typical construction equipment, blasting activities would be infrequent and over very short durations. Blasting typically involves a small scale, controlled, rolling detonation procedure resulting in limited ground upheaval. The blasts do not typically result in large, above ground explosions. Nonetheless, blasting in proximity to bird nests, during sensitive periods, for example, may cause adults to abandon nests, which could lead to egg or nestling mortality. Mountain Valley has prepared a Project-specific *General Blasting Plan* and would coordinate with appropriate federal and state agencies prior to conducting blasting operations to minimize impacts related to blasting.

While pipelines have no operational noise associated with them, during the operation of the pipeline, noise emissions also would 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. The effects on wildlife due to noise emissions would be minimal and highly localized.

Artificial lighting used during construction and at the aboveground facilities of the Project during operation would generate light pollution. Ecological light pollution refers to artificial lighting that affects natural patterns of light and dark in ecosystems, which in turn may affect wildlife (Longcore and Rich, 2004). The effects of ecological light pollution may include disorientation in nocturnal animals, disrupting migratory patterns of birds, altering seasonal day-length cues, which some wildlife may rely on as a trigger for critical behavior (e.g., migration).

Mountain Valley would only use artificial lighting as necessary during pipeline construction between the hours 7:00 am and 7:00 pm (on average) except for during emergencies or limited instances of 24-hour construction activities (e.g., HDD). Therefore, light pollution during construction would be minimal or, in the instances of the HDD activities, only for a relatively short duration.

To increase the speed and success of restoration of wildlife habitat, Mountain Valley would implement right-of-way restoration measures contained in FERC's Plan and Mountain Valley's Procedures, E&SC Plan, and solicit guidance from the USDA NRCS, VADCR, and NCWRC to restore the pipeline corridor using native seed mixes specific to the Project locations. Additionally, Mountain Valley would allow the right-of-way adjacent to a 10-foot-wide strip, maintained to facilitate periodic corrosion/leak surveys over the pipeline, to grow as scrub-shrub habitat, which would provide a more gradual transition between the pipeline corridor and surrounding forested habitat.

Aboveground Facilities, Contractor Yards, Access Roads

Agricultural lands and non-forested uplands combined would comprise the majority of wildlife habitat that would be affected by construction of the aboveground facilities. Approximately 44 percent of the lands affected by aboveground facilities would occur on herbaceous/scrub-shrub upland habitat and 38 percent would occur on agricultural lands. Upland forest habitat would comprise approximately 17 percent of the habitat affected by aboveground facilities, leaving less than 2 percent that would occur in wetland habitat. As noted in section 4.4.2, aboveground facilities and access roads would permanently affect less than 0.1 acre of wetlands. At the Lambert Compressor Station, an area of PFO would be converted to PEM/PSS for the construction and operation of the post-construction stormwater management system. Mountain Valley is finalizing the stormwater system design and evaluating modifications to avoid any impacts on this wetland.

Approximately 98 percent of the contractor yard acreages would occur in herbaceous/scrub-shrub upland habitat. The remaining 2 percent would occur in forested upland habitat.

Access roads would cross agricultural, upland forest, open upland, and both herbaceous/scrub-shrub and forested wetland habitats. Approximately 71 percent of the acreage necessary for access roads would cross herbaceous/scrub-shrub upland habitat. Wetland habitat would comprise less than 1 percent of the acreage necessary for access roads. Total acreages for the different components of the Project are provided in table 4.5-2.

The permanent footprint at the Lambert Compressor Station, and other aboveground facilities would be converted to developed land. Areas used for temporary and additional workspace at each facility would be restored and maintained as open land or allowed to revert to pre-construction land use cover. Following construction, Mountain Valley would restore and reseed any previously vegetated areas affected at contractor yards (unless approved in writing by the landowner). Use of access roads by construction personnel would temporarily displace wildlife species, and there would be the potential for a minor increase in wildlife fatalities along access roads due to the temporary increase in traffic during construction. We expect wildlife would return to the restored areas at aboveground facilities, contractor yards, and access roads post-construction. Wildlife habitat within the permanent footprint at aboveground facilities, which would be enclosed by fencing, and permanent access roads would be limited primarily to supporting songbirds and small mammals.

The Lambert Compressor Station would generate noise on a continuous basis once in operation, which would be limited to the general vicinity of the facilities. In addition, Transco's Compressor Station 166 is located approximately 600 feet north, and the Transco's Compressor Station 165 is located within a quarter mile, of the location proposed for the Lambert Compressor Station. Noise levels associated with compressor unit venting activities required for maintenance and emergency shutdown unit ventings would occur infrequently and would be short-term in duration. Section 4.11.2.3 provides a more in-depth description of noise levels associated with the Lambert Compressor Station.

Effects on wildlife from chronic noise may vary by species (e.g., Barber et al., 2009; Francis et al., 2011a, b; Francis et al., 2012; Blickley et al., 2012). 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). A mix of forest, open agricultural land, and developed industrial land would surround the Lambert Compressor Station. Mountain Valley would employ noise mitigation measures, such as compressor building walls, roof, doors, and ventilation systems designed to reduce noise emissions, turbine exhaust and intake silencers and breakouts, compressor unit venting silencers, and underground suction and discharge piping. The noise levels that wildlife would be exposed to beyond the compressor station property boundary would vary based on the distance from the facility. In the years following initial construction, wildlife tolerant of the operational noise associated with the new and existing compressor station facilities would remain in the area, while other species would likely move into similar available habitat farther from the noise source.

Mountain Valley would use downward facing, shielded lighting fixtures as required for security and operations purposes during operations at the aboveground facilities. Additionally, the Lambert Compressor Station would be located near existing compressor stations that are illuminated by artificial lighting in a similar capacity as would be required for the Lambert Compressor Station. As such, wildlife in the area are likely tolerant of artificial lighting at this location. Therefore, the effects of artificial lighting on wildlife would be sufficiently minimized.

As with the pipeline right-of-way, Mountain Valley would implement post-construction restoration measures at aboveground facilities, contractor yards, and access roads to increase the speed and success of restoration of wildlife habitat. Mountain Valley would follow guidelines contained in FERC's Plan and Mountain Valley's Procedures and solicit guidance from the USDA NRCS, VADCR, and NCWRC to restore these areas using native seed mixes specific to the Project locations. We expect wildlife would return to the restored areas post-construction.

4.6.2 Sensitive and Managed Wildlife Habitats

Sensitive or managed wildlife habitats such as national forests and wildlife refuges, state forests and parks, wildlife management areas, and reserve program lands are generally established to protect lands and waters that have a high habitat value for wildlife, or for public hunting, trapping, fishing, and other compatible recreational uses. The Project would not cross any National Wildlife Refuges, Wildlife Management Areas, or other federally protected lands. Nor would the Project come within 3 miles of any state Wildlife Management or Game Areas in Virginia or North Carolina, respectively. However, the Project would cross multiple state-managed or private conservation areas, including two North Carolina Forest Legacy Areas (MPs 26.1 to 36.3 and MPs 42.2 to 48.4) and a Piedmont Land Conservancy Easement (MP 37.7). The Forest Legacy Program was created by the U.S. Congress to protect environmentally important forest lands that are threatened by conversion to non-forested uses (NCFS, 2017a). The Piedmont Land Conservancy easements are voluntary legal agreements entered into by private landowners to protect their property from development.

4.6.2.1 Sensitive and Managed Wildlife Habitat Impacts and Mitigation

The impacts on wildlife within the North Carolina Forest Legacy Areas and Piedmont Land Conservancy Easement would be consistent with those of the corresponding habitats in other portions of the Project right-of-way. The Project would primarily be collocated with an existing utility right-of-way within the North Carolina Forest Legacy Areas. It would cross a mixture of non-forested upland habitats in addition to approximately 148.9 acres of forested habitat. The land crossed within the Piedmont Land Conservancy Easement would consist of an approximately 0.1-mile stretch comprised of early successional forest edge habitat.

The Project would also pass through about 3 miles of the Virginia Piedmont Forest Block Complex Important Bird Area (IBA) between MPs 22.7 and 25.7. The IBA Program is an international initiative developed to identify, protect, and manage critical areas associated with vital bird habitat and associated biodiversity (Audubon, 2019). IBAs are sites that provide essential habitat to one or more bird species for at least one portion of their life history (e.g., during breeding, wintering, and/or migrating). Areas designated as IBAs support species of conservation concern (e.g., threatened, endangered, or rare species), species with limited or restricted ranges, and/or species that are vulnerable because their populations are concentrated in one habitat type or occur in high concentrations due to congregation. The National Audubon Society administers the IBA Program in the United States in partnership with BirdLife International. The Forest Block Complex IBAs were established as a means to protect viable populations of priority bird species by establishing a network of forested landscapes along the Atlantic Flyway, which the Project would cross[17].

However, the portion of the Virginia Piedmont Forest Block Complex IBA that would be crossed by the Project is not a uniform block of forested habitat. The block is currently crossed by U.S. Highway 311, multiple state roads, a railroad right-of-way, an electrical transmission right-of-way, and an additional existing right-of-way with which the Project would be collocated. The block contains approximately 15,567 acres of forested habitat based on a National Land Cover Database (NLCD) review (Homer et. al., 2015). Construction activities would clear approximately 41.2 acres of forested edge habitat along an existing right-of-way and operation of the Project would permanently convert approximately 15.4 acres of the forested edge habitat to herbaceous or

[17] The Atlantic flyway is one of four broad areas (in addition to the Mississippi, Central, and Pacific flyways) that contain the routes of migrating birds from summer nesting sites throughout North America, including the Arctic, to their wintering grounds in southern North America, the Caribbean, and South America. In the United States, the Atlantic flyway generally consists of the states along the east coast, including North Carolina and Virginia.

scrub-shrub habitat. This would equate to a long-term decrease of 0.3 percent of the forested habitat and permanent loss of 0.1 percent of the forested habitat in the block of the Virginia Piedmont Forest Block Complex through which the Project would pass. Given that the Project route would affect primarily forest edge habitat, would be primarily collocated with an existing right-of-way, and would impact a relatively low proportion of forested habitat within the forest block, we conclude the effects of the Project on wildlife within sensitive and managed wildlife areas would not be significant.

4.6.3 Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Colonial Nesting Birds

4.6.3.1 Migratory Birds

Migratory birds are protected under the MBTA (16 United States Code [U.S.C.] 703-711). The MBTA, as amended, prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, or nests unless authorized under a FWS permit. Bald and golden eagles are protected under the BGEPA (16 U.S.C. 668-668d). Executive Order (EO) 13186 directs executive departments and 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 particular focus should be given to addressing population-level impacts.

On March 30, 2011, the FWS and the FERC entered into a Memorandum of Understanding that focuses on avoiding and minimizing adverse impacts on migratory birds, with a focus on species of concern, and strengthening migratory bird conservation through enhanced collaboration. This voluntary agreement 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 FWS created the Birds of Conservation Concern (BCC) list (FWS, 2008) with the goal of preventing or removing the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with EO 13186.

A variety of migratory birds and BCC use or could use the habitats affected by the Project. These birds use these habitats for resting (stopover), sheltering, foraging, breeding, and/or nesting. The Project would be in the North American Bird Conservation Initiative (NABCI) Bird Conservation Region (BCR) 29 (BCR 29: Piedmont; NABCI, 2018). Table 4.6-2 lists 12 Project-specific migratory bird species of concern with preferred nesting habitat that would potentially be affected by the Project. These include BCC species, species listed as conservation priorities in the BCR 29 Implementation Plan (Watson, 2014), species listed in the Virginia Wildlife Action Plan as species of greatest conservation need (VADGIF, 2015), and species listed by the NCNHP (2018a) as species with conservation concerns.

TABLE 4.6-2

Migratory Bird Species of Concern Potentially Present within the Southgate Project Area

Common Name	Source a/	Project County	Preferred Nesting Habitat b/	Primary Nesting Season
American woodcock	BCR 29 Plan; VADGIF	Pittsylvania; Rockingham; Alamance	Habitat consists of young forests and abandoned farmland mixed with forested land. Generally considered an edge species.	Apr. 1 to Aug. 31
bald eagle	BGEPA; BCC	Pittsylvania; Rockingham; Alamance	Nests in trees among forests adjacent to large water bodies	Jan. 1 to Aug. 31
brown-headed nuthatch	BCC; BCR 29 Plan	Rockingham; Alamance	Mature and open longleaf pine stands; at least locally common in open loblolly, shortleaf, and pond pine stands, less so in Virginia pine. In the Piedmont, birds favor thinned or more open pine stands, such as in residential areas, golf courses, margins of lakes and ponds, and edges.	Apr 15 to Aug. 15
eastern whip-poor-will	BCC; BCR 29 Plan	Pittsylvania	Forests and woodlands; no nest built, eggs laid on flat ground.	May 1 to Aug. 15
grasshopper sparrow	BCR 29 Plan; NCNHP	Pittsylvania; Rockingham; Alamance	Fallow fields, pastures, hayfields, grasslands, and other areas dominated by graminoid vegetation.	May 15 to Aug. 15
Kentucky warbler	BCC; BCR 29 Plan	Pittsylvania; Rockingham; Alamance	Prefers deep shaded woods with dense, humid thickets, bottomlands near creeks and rivers, ravines in upland deciduous woods, and edges of swamps; nests on ground or within a few inches of it	May 1 to Aug. 15
northern bobwhite	BCR 29 Plan	Pittsylvania; Rockingham; Alamance	Fallow fields, pastures, hayfields, grasslands, and other areas dominated by graminoid vegetation	Apr 15 to Aug. 31
prairie warbler	BCC; BCR 29 Plan	Pittsylvania; Rockingham; Alamance	Shrubby pastures, low pines; nest usually in a tree (such as pine, cedar, sweetgum, oak), 1-45' above the ground	May 1 to Jul 31
prothonotary warbler	BCR 29 Plan	Rockingham; Alamance	Wooded swamps, wetlands, river bottom hardwoods; Nest site usually 5- 10' up (sometimes 3-30' up), above standing water in hole in tree or stump.	May 15 to Jul 31
red-headed woodpecker	BCR 29 Plan	Rockingham; Alamance	Groves, farm country, orchards, shade trees in towns, large scattered trees; nests in tree cavities	May 10 to Sep. 10
willow flycatcher	NCNHP	Rockingham	Open country, mainly in wide valleys with streamside thickets and corridors of trees adjacent to fields; marshes with shrubs and small trees	June 1 to Aug. 15

TABLE 4.6-2

Migratory Bird Species of Concern Potentially Present within the Southgate Project Area

Common Name	Source a/	Project County	Preferred Nesting Habitat b/	Primary Nesting Season
wood thrush	BCC; BCR 29 Plan	Pittsylvania; Rockingham; Alamance	Mainly deciduous woodlands; nest placed in vertical fork of tree (usually deciduous) or saddled on horizontal branch, usually about 10-15' above the ground, sometimes lower, but rarely as high as 50'.	May 1 to Aug.31

a/ BCC =Included as 2008 Bird of Conservation Concern for Bird Conservation Region 29 (FWS, 2008); BCR29 Plan: Considered a priority species in the 2014 BCR 29 Implementation Plan (Watson, 2014). VAFWIS = Virginia Fish and Wildlife Information Service. NCNHP = North Carolina Natural Heritage Program's database; BGEPA = Bald and Golden Eagle Protection Act.

b/ acreages of habitat that would be affected by the Project are provided in tables 4.5-1 and 4.8-1.

Generally, the migratory bird species of concern listed in table 4.6-2 are experiencing population declines due to habitat loss and fragmentation. Loss and fragmentation of forested habitat could negatively affect species such as the brown-headed nuthatch, prothonotary warbler, willow flycatcher, and wood thrush; however, clearing associated with the Project could eventually provide habitat for species such as the American woodcock, eastern whip-poor-will, grasshopper sparrow, northern bobwhite, and prairie warbler.

4.6.3.2 Migratory Birds Impacts and Mitigation

If construction occurs during the nesting season, increased human presence and noise from construction activities could disturb actively nesting birds resulting in incidental take of migratory bird species. Impacts would likely not be significant for non-nesting birds, as these individuals could temporarily relocate to avoid construction activities. However, construction activity near active nests during incubation or brood rearing could result in nest abandonment; which, in turn, could lead to overheating, chilling, or desiccation of unattended eggs or young; and subsequently nestling mortality; premature fledging; and/or ejection of eggs or young from the nest. Additionally, loss and/or conversion of existing habitat and the subsequent displacement of birds could affect mating, nesting, rearing, foraging, and predator avoidance behaviors. As a result, migratory birds could experience increased predation, competition, and rates of stress, injury, and mortality.

Mountain Valley would attempt to minimize Project impacts on migratory birds by conducting vegetation clearing during construction outside of the peak migratory bird nesting season (May 1 through August 15). The FWS recommended that Mountain Valley avoid clearing from March 15 - August 15 in Virginia and from April 1 - August 31 in North Carolina. Based on Mountain Valley's currently proposed construction schedule, we believe it unlikely that Mountain Valley would be able to avoid construction clearing entirely during the nesting season. Therefore, **we recommend:**

- **<u>Prior to construction</u>, Mountain Valley should consult with the FWS and identify measures to minimize impacts on migratory birds if vegetation clearing for construction would occur during the migratory bird nesting season (March 15 - August 15 in Virginia and April 1 - August 31 in North Carolina). Mountain Valley should file these measures with the Secretary, for review and written approval by the Director of OEP, along with records of its consultation with FWS.**

Mountain Valley has also attempted to minimize the loss of migratory bird habitat by collocating the Project route with existing rights-of-way or previously disturbed habitat for more than 50 percent of the proposed route and reduce the width of the construction right-of-way to 75 feet where the pipeline would cross waterbodies or wetlands. FERC's Plan prohibits routine vegetation mowing or clearing during operation of the Project between April 15 and August 1 of any year. Mountain Valley would coordinate with the VADGIF, NCWRC, and local conservation districts to develop right-of-way mowing schedules and conservation practices beneficial to bird species (and other wildlife) that may use the Project right-of-way as nesting or foraging habitat.

Conducting vegetation clearing outside of the peak migratory bird nesting season would minimize incidental take of nesting migratory birds. If nesting season avoidance is not possible, we have recommended above that Mountain Valley identify mitigation measures in consultation with the FWS to minimize impacts. Construction and operation of the Project would have short-term to permanent effects on migratory bird habitat. Impacts on non-forested upland habitat by construction of the pipeline would be short-term and temporary, since these areas would return to their herbaceous or scrub-shrub vegetative cover within 1 to 2 years post-construction. Impacts on forested habitat would be long-term to permanent, as forested habitat cleared for construction would likely require several decades to recover and forested habitat in the permanent right-of-way would be permanently converted to herbaceous or non-forested habitat for the operational life of the Project. Approximately 615.3 acres of forest habitat (including forested wetland) would be affected by construction of the Project, 241.8 acres of which would be permanently converted to herbaceous or scrub-shrub habitat for the operational life of the Project.

Given the steps Mountain Valley would take to attempt to minimize Project impacts on migratory birds, and the relatively low percentage of forested habitat generally and interior forest habitat specifically that would be affected in comparison with available forested habitat in the vicinity of the Project (as described in sections 4.6.1.1 and 4.6.5.1), we conclude Project impacts on migratory birds would be minimized to the extent practicable and not significant.

4.6.3.3 Bald and Golden Eagles

The Project would not cross any known bald eagle (*Haliaeetus leucocephalus*) concentration areas (FWS, 2018a). Additionally, no bald eagle nests are located within 0.5 mile of the Project footprint in either Virginia or North Carolina based on assessments of the FWS Virginia Field Office's Bald Eagle Map Tool (FWS, 2018a), the Center for Conservation Biology Virginia Bald Eagle Nest Locator (Center for Conservation Biology, 2018), and the NCNHP Data Explorer (NCNHP, 2018a). According to information provided by VADGIF, the closest known bald eagle nest exists approximately 8 miles from the Project right-of-way in Pittsylvania County. Golden eagles are not known to nest in the eastern United States and are primarily only found in the western mountainous regions of Virginia and North Carolina during migration or in winter (Katzner et al, 2012).

4.6.3.4 Bald and Golden Eagles Impacts and Mitigation

Although there are no currently documented bald eagle nests within 0.5 mile of the Project footprint, the possibility exists that bald eagles could build nests in the vicinity of the Project prior to the start of construction. To account for this possibility, and in order to ensure that impacts on bald eagles would be minimized, Mountain Valley would conduct bald eagle nest surveys during the winter prior to the beginning of construction within 0.5 mile of the Project rights-of-way. We provide a recommendation below that Mountain Valley file the results of the bald eagle nest surveys with the Secretary prior to the beginning of construction.

If bald eagle nests were discovered during the pre-construction winter nest surveys, Mountain Valley would follow measures adapted from the FWS National Bald Eagle Management Plan Guidelines (FWS, 2007) and the Virginia Department of Game and Inland Fisheries Bald Eagle Guidelines for Landowners (VADGIF, 2012) between December 15 and July 15. The measures Mountain Valley would follow include:

- restricting blasting or any use of explosives to greater than 0.5 mile (or 1 mile in open areas) from an active nest during the nesting season (December 15 through July 15);
- maintaining a buffer of at least 660 feet between Project-related activities and the nest;
- restricting all vegetation clearing and ground disturbance within 660 feet of the nest to outside of the nesting season; and
- maintaining any established landscape buffers between Project-related activities and active nests.

Based on Mountain Valley's intent to conduct nest surveys and implement the noted protective measures, we conclude Project impacts on bald eagles would be avoided or minimized sufficiently.

4.6.3.5 Colonial Nesting Birds

In BCR 29, colonial nesting birds commonly consist of wading birds such as great blue herons, great egrets, and other smaller herons and egrets that nest in multispecies colonies in trees and shrubs in close proximity to waterbodies. In North Carolina, population trends of some smaller herons and egrets such as little blue herons, tri-colored herons, and snowy egrets indicate declines in the numbers of nesting pairs but the causes of these declines are unknown (NCWRC, 2015). Wading bird habitat in the Piedmont Region generally consists wetland areas associated with ponds, lakes, reservoirs, and rivers (Hunter et. al., 2006). The primary threat to wading bird populations is habitat loss and degradation due to land clearing and construction activities associated with human development (Hunter et. al., 2006; NCWRC, 2015).

4.6.3.6 Colonial Nesting Birds Impacts and Mitigation

Mountain Valley received a recommendation from the North Carolina Wildlife Resources Commission (NCWRC) in August of 2018 (NCWRC, 2018b) to avoid construction activities within 0.5 mile of any active colonial nesting bird rookeries. The NCWRC further recommended that Mountain Valley conduct surveys for rookeries within 0.5 mile of the Project rights-of-way during the winter months prior to construction. Mountain Valley has accordingly committed to conducting the rookery surveys concurrently with the bald eagle nest surveys. Additionally, Mountain Valley would maintain established landscape buffers between Project-related activities and active rookeries and would refrain from construction activities within 0.5 mile of any rookery between February 15 and July 31. Based on Mountain Valley's intent to conduct rookery surveys and implement the noted protective measures, we conclude Project impacts on colonial nesting birds would be avoided or minimized to the extent practicable.

To confirm whether Mountain Valley would need to implement the above-noted measures protective of nesting bald eagles and/or colonial rookeries, **we recommend:**

- **<u>Prior to construction</u>, Mountain Valley should file with the Secretary, the results of the pre-construction bald eagle nest and colonial rookery surveys.**

4.6.4 Game Species

Big game species that may be present in the vicinity of the Project include white-tailed deer and wild turkey. Other game species, such as furbearers, game birds, and small game, may be found in the Project area. Furbearers include American beaver, common raccoon, gray fox, muskrat, red fox, and striped skunk. Small game species within the Project area include species such as eastern gray squirrel, fox squirrel, groundhog, and Virginia opossum. Game birds in the vicinity of the Project would potentially include both upland birds, such as the American woodcock and mourning dove, as well as waterfowl, such as the American black duck, American coot, blue- and green-winged teal, Canada goose, northern pintail duck, and sora.

4.6.4.1 Game Species Impacts and Mitigation

Impacts on game species would be similar to the general impacts on wildlife discussed previously. Following construction, game species could utilize the newly established rights-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 noxious weeds are adequately controlled and native forage seeding is successful. In general, large and small game species would be expected to return to habitats they vacated after construction and restoration efforts are completed, and harvest success rates would likely be similar to pre-construction success rates.

The new pipeline rights-of-way could increase access to remote hunting areas, which could result in increased hunting success. 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). This increased access to previously inaccessible hunting areas could also result in trespassing on private lands, and an increase of poaching of game and non-game wildlife. In section 4.9 (Transportation) we discuss measures that could be utilized to keep ATVs or similar off road vehicles from using the right-of-way.

4.6.5 Fisheries and Aquatic Resources

The Project would cross freshwater waterbodies, including perennial, intermittent, and ephemeral streams. No marine or estuarine waterbodies would be crossed or affected by the Project. Refer to section 4.3 for additional information regarding waterbodies; table 4.3-4 summarizes the waterbodies crossed by the Project. As described in section 4.3.2.1, constructing and operating the Project would require 224 waterbody crossings, many of which provide aquatic habitat and support fisheries. The H-650 pipeline would cross 125 perennial waterbodies but the H-605 pipeline would not cross any perennial waterbodies.

The character of fisheries and aquatic habitats are typically influenced by water temperature (warmwater or coldwater), fishing uses (commercial or recreational), and migration patterns (anadromous and catadromous fish species). Warmwater streams are generally capable of supporting a high diversity of fish assemblages, including suckers, sunfishes, and catfishes, and other species that are able to tolerate water temperatures greater than 68°F. The Project would only cross warmwater fisheries. In addition to supporting fisheries, crossed waterbodies support other aquatic species including mussels and other invertebrates. Fish and aquatic species commonly found in the waterbodies crossed by the Project are listed in table 4.6-3.

TABLE 4.6-3 **Typical Fish and Aquatic Species within the Southgate Project areas a/**
Fish bowfin, central stoneroller, American shad, American eel, blue ridge sculpint, redbreast sunfish, rosyside dace, mountain redbelly dace, white catfish, pirate perch, white sucker, yellow bullhead, brown bullhead, flier, satinfin shiner, whitefin shiner, gizzard shad, bluespotted sunfish, creek chubsucker, redfin pickerel, chain pickerel, swamp darter, Johnny darter, tessellated darter, sawcheek darter, cutlip minnow, speckled killifish, eastern mosquitofish, eastern silvery minnow, northern hog sucker, longnose gar, green sunfish, pumpkinseed, warmouth, bluegill, white shiner, crescent shiner, blueside shiner, largemouth bass, spotted sucker, white perch, striped bass, blacktip jumprock, notchlip redhorse, golden redhorse, shorthead redhorse, bluehead chub, bull chub, golden shiner, whitemouth shiner, highfin shiner, comely shiner, redtip shiner, spottail shiner, coastal shiner, swallowtail shiner, orangefin madtom, margined madtom, yellow perch, piedmont darter, chainback darter, shield darter, black crappie, eastern blacknose dace, brassy jumprock, creek chub, eastern mudminnow
Freshwater Mussels Carolina lance, eastern elliptio, northern lance, variable spike, box spike, Atlantic spike, lake fingernailclam, swamp fingernail clam, pond fingernail clam, long fingernail clam, Adam peaclam, ridgedback peaclam, ubiquitous peaclam, triangular peaclam, eastern floater, river fingernail clam, Herrington fingernail clam, grooved fingernail clam, striated fingernail clam, eastern pondhorn, paper pondshell
Invertebrates - Crayfish acuminate crayfish, Carolina ladie crayfish, devil crayfish, rocky river crayfish, sandhills spiny crayfish, variable crayfish, Atlantic slope crayfish, sickle crayfish, digger crayfish, white river crayfish, red swamp crayfish, Carolina sandhills crayfish, Croatan crayfish
Sources: NCNHP 2016; 2018a; NCWRC 2015; VADGIF 2015, 2018 a/ Typical fish and aquatic species; list is not intended to be comprehensive.

4.6.5.1 Fisheries of Special Concern

Federally or state-listed endangered, threatened, or candidate fish or aquatic species, coldwater fisheries, and fisheries with significant economic value resulting from the presence fish stocking programs, or commercial harvesting are all considered fisheries of special concern. In the Commonwealth of Virginia, the VADEQ has water use classifications that include propagation and growth of a balanced indigenous population of aquatic life. In North Carolina, NCDEQ designated Outstanding Resource Waters based on the functional value and use of a waterbody. Federally or state-listed endangered, threatened, or candidate fish and aquatic species are addressed in section 4.7.

The Project would cross 21 perennial waterbodies containing fisheries of special concern: 8 in Virginia, and 13 in North Carolina. Recreational fishing is a large economic driver in both Virginia and North Carolina. However, the Project would not cross any trout waterbodies or coldwater fisheries and the Project would not directly affect fishing rivers or streams suggested by the VADGIF (VADGIF, 2019a) or fishing access locations suggested by the NCWRC (NCWRC, 2019a). Therefore, aside from potential temporary disruptions of fishing in the vicinity of the waterbody crossings during construction, we do not expect the Project to incur more than minor and temporary impacts on recreational fisheries in Virginia or North Carolina. Table 4.6-4 summarizes the crossings of waterbodies containing fisheries of special concern, including waterbody name, location, fishery of special concern, and crossing restrictions.

4.6.5.2 Fisheries of Special Concern Impacts and Mitigation

Impacts on fisheries of special concern would be the same as those described below for impacts on general fisheries and aquatic resources. Mountain Valley would implement erosion and sediment control BMPs described in its E&SC Plan at all crossings of waterbodies containing fisheries of special concern. Mountain Valley also would adhere to all federal and state permit conditions, including those regarding the minimization of impacts on fisheries of special concern including adhering to recommended work windows for in-water construction (or requesting a work-window modification, if needed). Mountain Valley would attempt to minimize impacts on fisheries by relocating fishes and mussels from the construction areas. All fish and freshwater mussel relocations would be supervised by qualified, professional biologists in possession of pertinent federal and/or state permits.

TABLE 4.6-4

Fisheries of Special Concern Crossed by Southgate Project

County	MP	Waterbody ID	Stream Name	Proposed Crossing Method	Fishery Type	Restricted In-stream Construction Window a/
Virginia						
Pittsylvania	4.9	S-E18-3	Banister River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per VADCR & VADGIF communications); no protected mussel species documented during 2019 aquatic surveys.	June 1 through November 30 b/
	17.7	S-E18-44	Sandy River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per VADGIF communication); no protected mussel species documented during 2019 aquatic surveys.	June 1 through November 30 b/;
North Carolina						
Rockingham	27.5	S-A18-42	Cascade Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per NCWRC and FWS communication)	June 1 through November 30 b/;
	27.7	S-A18-40	Cascade Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per NCWRC and FWS communication)	June 1 through November 30 b/;
	30.2	S-A18-17	Dan River	HDD	Potential Occurrence of Protected Mussel and Fish Species (per NCWRC and FWS communication)	June 1 through November 30 b/;
	31.4	S-B18-95	Rock Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	32.2	S-A18-147	Machine Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	32.7	S-A18-151-A	Town Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	33.1	S-A18-151-B	Town Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	38.8	AS-A18-8	Wolf Island Creek	Conventional Bore	Potential Occurrence of Protected Mussel and Fish Species (per NCWRC and FWS communication)	June 1 through November 30 b/;
	41.2	S-B18-56	Lick Fork	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;

TABLE 4.6-4

Fisheries of Special Concern Crossed by Southgate Project

County	MP	Waterbody ID	Stream Name	Proposed Crossing Method	Fishery Type	Restricted In-stream Construction Window a/
	43.3	S-A18-176	Jones Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	47.0	S-C18-76/ AS-C18-76	Hogans Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	48.7	S-A18-60	Giles Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
Alamance	50.9	AS-NHD-305	UNT Haw River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	52.8	S-B18-94	UNT Haw River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/
	53.7	S-A18-84	UNT Haw River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/
	58.7	S-C18-11	UNT Haw River	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	63.6	S-B18-16/AS-B18-16	Stony Creek	HDD	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	64	AS-NHD-1547	Deep Creek	Conventional Bore	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;
	67.1	AS-NHD-1558	Boyds Creek	Dry Crossing	Potential Occurrence of Protected Mussel Species (per NCWRC communication)	June 1 through November 30 b/;

Note: MP listed for access roads is nearest pipeline MP.

a/ Restricted In-Stream Construction Windows are the date ranges in which in-water construction is allowed to occur. June 1 through November 30 is the FERC mandated warmwater habitat construction window; in-water work, except that required to install or remove equipment bridges, must be completed between these dates unless expressly permitted or further restricted in writing on a site-specific basis by the appropriate federal or state agency.

b/ Pending consultations regarding results of spring 2019 aquatic species surveys

4.6.5.3 General Fisheries and Aquatic Resources Impacts and Mitigation

Constructing and operating the Project could temporarily impact fisheries and aquatic resources. As discussed in greater detail below, sedimentation and turbidity, alteration or removal of in-stream and stream bank cover, stream bank erosion, introduction of water pollutants, water depletions, and entrainment of small fishes and fry during water withdrawals could increase the rates of stress, injury, and mortality experienced by fish and other aquatic life. In general, fish would migrate away from these activities. This displacement could lead to a temporary increase in competition for habitat and food and could affect fish survival and health. The degree of impact on fisheries from construction activities would depend on the waterbody crossing method, the timing of construction, and the characteristics of aquatic species present.

Sedimentation and Turbidity

Increased sedimentation and turbidity resulting from in-stream and adjacent construction activities could displace and impact fish and aquatic resources. 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 of in-stream biota. Turbid conditions could also reduce the ability for biota to find food sources or avoid prey. 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. Mountain Valley proposes to use dry crossing techniques for all waterbodies that would not be crossed using HDD or bore methods, which would limit downstream sedimentation and turbidity during construction; and limit the potential impacts on fisheries and aquatic resources.

Benthic invertebrates and freshwater mussels could also be affected by elevated turbidity and suspended sediments. 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).

While several factors can influence the effectiveness of dry-ditch construction across waterbodies, if the crossings are properly installed and maintained during construction and restoration, the levels of sediment and turbidity produced are typically minor. A study conducted by the USGS (Moyer and Hyer, 2009) investigating the effects of dry-ditch waterbody crossings on downstream sediment loading found that short-term increases in turbidity downstream of construction did occur, but the magnitude of the increase was small and considered to be minimal compared to increased turbidity associated with natural runoff events. Other literature (e.g., Reid et. al., 2004) assessing the magnitude and timing of suspended sediment produced from dry-ditch crossing methods indicates the duration of increased sedimentation would be mostly short-term (i.e., less than 1 to 4 days) and remain near the crossing location (i.e., an approximate downstream distance of a few hundred feet). Mountain Valley is conducting an analysis of indirect sedimentation, which would be included with its mussel survey reports.

Inadvertent Releases During Horizontal Direction Drilling and Impacts of Conventional Boring

Conventional bore and HDD crossing methods both avoid direct impacts on waterbodies by boring underground to cross the waterbody instead of trenching through the streambed and banks. For both crossing methods, Mountain Valley would place boring locations outside of the waterbody and associated riparian area and no disturbance of the waterbody is required. Conventional bore and HDD crossing methods are proposed for crossings where sensitive fish or mussel species presence required the crossing to avoid waterbody disturbance. Further discussion of conventional bore impacts and mitigation are provided in section 4.3.2.2.

The HDD method could result in a release of drilling fluid into a waterbody. Although drilling fluid consists of non-toxic materials (see section 4.1.4.10), if inadvertently released into a waterbody, the drilling fluid could settle on the streambed and temporarily inundate bottom habitat. Benthic organisms and spawning and nursery habitat could be adversely affected by the settling of drilling fluids. Additionally, an inadvertent release of drilling fluid would result in turbidity and suspension of drilling fluids in the water column, affecting aquatic biota as described above for turbidity impacts. Mountain Valley would implement protocols provided in its *Horizontal Directional Drill Contingency Plan* to readily detect an inadvertent release of drilling fluid and take immediate action to minimize impacts on aquatic habitat.

Loss of Stream Bank Cover

Stream bank vegetation, large woody debris, rocks, and undercut banks are known cumulatively as riparian habitat. Riparian habitat provides valuable structure and opportunities for fish and stream biota. Open-cut crossings would temporarily remove shading over this habitat 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.

Mountain Valley would minimize clearing of trees and other riparian vegetation to include only what is necessary to construct and operate the Project safely. Mountain Valley would minimize impacts on riparian vegetation by narrowing the width of the standard construction rights-of-way at waterbody crossings to 75 feet, and would locate ATWS at least 50 feet from waterbody banks (Mountain Valley would be required to request deviations from the FERC Procedures where it is infeasible to do such). Once construction is complete, streambeds and banks would be stabilized and restored to pre-construction conditions to the fullest extent possible in compliance with Mountain Valley's Procedures.

Stream banks would be revegetated with native vegetation seed mixes based on the vegetative community present prior to construction. Mountain Valley would keep trees clear from a 10-foot-wide corridor directly over the pipeline, which would be mowed at a frequency sufficient to keep the corridor in an herbaceous state, and selectively remove trees as needed over a 30-foot-wide corridor to prevent tree roots from damaging the pipeline. However, trees could regenerate in the temporary construction work areas, allowing much of the ecological function of the riparian conditions (e.g., bank stabilization, filtration, shade, future large wood, and organic input) to return.

After construction and restoration, stream bank shrub and riparian tree species would be expected to re-establish 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). Thus, impacts on stream banks should be mostly short-term, except within the permanent operational pipeline easement where the conversion of forest to shrub vegetation would be permanent. The recovery of riparian habitat in forested areas of temporary construction workspaces would be long-term because of the time it would take for trees to regenerate and mature.

Fuel and Chemical Spills

An inadvertent release of fuel or oil or other hazardous materials from construction equipment into waterbodies could impact fish and aquatic species. A leak of hazardous material into a waterbody could result in direct mortality to aquatic species, 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.

Mountain Valley would implement its SPCC Plan, which would include preventive measures such as personnel training, equipment inspection, and refueling procedures to reduce the likelihood of spills, as well as mitigation measures such as containment and cleanup to minimize potential impacts should a spill occur. Adherence to the SPCC Plan would largely prevent a large spill from occurring near surface waters because construction equipment fueling and bulk hazardous material storage would be prohibited within 100 feet of the waterbody banks. In addition, portable equipment such as water pumps would be placed in secondary containment structures in order to contain any leaks or spills.

Hydrostatic Testing and Water Withdrawals

Mountain Valley would primarily utilize municipal water for hydrostatic testing of the pipeline and dust control (see section 4.3.2.6). Mountain Valley is proposing to obtain hydrostatic test water from two municipal sources as described in table 4.3-7. Mountain Valley estimates it would acquire about 3,600,000 gallons from a municipal source for Spread 1 and about 2,300,000 gallons from a municipal source for Spread 2. If required, additional water sources for dust control on Project roads would include groundwater supply wells and approved surface water locations. Mountain Valley would minimize crushing, entrainment, or impingement of mussels and fishes associated with water intake pumps by following guidance from VADEQ pertaining to screen size and through-screen intake velocity protective of aquatic organisms. Mountain Valley would use temporary floating, screened intake pumps with screen mesh sizes no larger than 0.039 inches and intake velocities of 0.25 feet per second or less. Mountain Valley would also withdraw no more than 10 percent of the instantaneous flow rate from source waterbody.

Mountain Valley would minimize impacts from water withdrawals by adhering to the measures in Mountain Valley's Procedures and E&SC Plan. The measures outlined in these plans include preventing water withdrawal from and discharges into exceptional value waters or waters that provide habitat for federally listed threatened and endangered species, unless approved by applicable resource and permitting agencies; screening and positioning water intakes at the water surface to minimize the entrainment of fish and other biota; maintaining adequate flow rates to protect aquatic species; placing water pumps in secondary containment devices to minimize the potential for fuel spills or leaks; regulating discharge rates; and using energy dissipating devices and sediment barriers to prevent erosion. Mountain Valley would obtain and comply with all state water withdrawal and discharge permits.

Blasting

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).

Mountain Valley would attempt to avoid blasting during waterbody crossings. If blasting is deemed necessary, Mountain Valley would follow the measures outlined in its *General Blasting Plan* including isolating the work area from the surrounding waterbody prior to setting off charges. That plan indicates that Mountain Valley would prepare and implement Project-specific blasting plans, in coordination with federal and state agencies, to minimize impacts on aquatic species. The locations where blasting would potentially be necessary are discussed in section 4.1.4.7.

4.6.6 Wildlife and Fisheries Conclusions

Mountain Valley would minimize impacts on wildlife and habitat by following the measures outlined in FERC's Plan and Mountain Valley's Procedures, and other BMPs, by routing the pipeline to minimize impacts on sensitive areas, collocating the pipeline with other rights-of-way where feasible, and reducing the construction right-of-way through wetlands. Based on our review of the potential impacts discussed above, we conclude that constructing and operating the Project would not significantly impact wildlife, terrestrial habitats, migratory birds, or fisheries and aquatic resources.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are afforded protection by law, regulation, or policy by federal and/or state agencies. For the purposes of this EIS, special status species include federally listed species that are protected under the ESA or are proposed for such listing by the FWS; federal species of concern; and species that are state-listed as threatened, endangered, or have been given certain other state designations.

Impacts on endangered, threatened, and other special status species would be similar to those listed in section 4.6 for wildlife and aquatic species. However, impacts on special status species may be greater than impacts on other wildlife and vegetation because these species may be more sensitive to disturbance; more specific to a habitat; and less able to move to unaffected suitable habitat since such habitat may not be available within a reasonable proximity, may not be available at all, or may exist only in small tracts. Potential impacts that could affect the conservation needs of a species or decrease the viability of a population include habitat fragmentation, loss, or degradation; decreased breeding or nesting success; increased predation or decreased food sources; and injury or mortality.

4.7.1 Federally Listed Threatened, Endangered, and Other Species of Concern

Federal agencies are required by the 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 determining whether any federally 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. None of the waters crossed by the Project are managed by the National Marine Fisheries Service (NMFS). Consequently, consultation with the NMFS is not required.

For actions involving major construction activities with the potential to affect listed species or critical habitats, the lead federal agency must prepare a BA. The lead federal agency must submit its BA to the FWS and, if it is determined that the action may adversely affect a federally listed species, the lead agency must submit a request for formal consultation to comply with Section 7 of the ESA. We have not determined that the Project would adversely affect a listed species. However, we are submitting this draft EIS as our BA and requesting informal consultation with the FWS under Section 7 of the ESA. To satisfy informal consultation, we request FWS concurrence with our determinations of effect described below.

Mountain Valley informally coordinated with the FWS regarding federally listed species and designated critical habitat in the Project areas. Mountain Valley also communicated with the VADCR-DNH, VADGIF, NCNHP, and NCWRC. Based on these communications and a review of the FWS' Information for Planning and Conservation (IPaC) database and other publicly available information, eight federally listed or otherwise sensitive species were identified as occurring or possibly occurring in the Project areas. Table 4.7-1 lists the federally threatened, endangered, and other federal species of concern that are known to occur or could occur within the Project areas. None of the identified species have designated critical habitat in the Project area.

The Project would not affect any federally threatened, endangered, or special status species of birds. Bald and golden eagles are not listed species under the ESA; however, they are protected under the MBTA and BGEPA. Federal protection of bald and golden eagles and their presence in the vicinity of the Project is discussed in section 4.6.1.1.

TABLE 4.7-1

Federal Endangered, Threatened, or Other Special Status Species Known to Occur or Potentially Occurring in the Southgate Project Area a/, b/

Common Name	Scientific Name	Status b/	Determination of Effect
Mammals			
Northern long-eared bat	*Myotis septentrionalis*	T	Not Likely to Adversely Affect
Fish			
Roanoke logperch	*Percina rex*	E	Not Likely to Adversely Affect
Mussels			
Atlantic pigtoe	*Fusconaia masoni*	PT	Not Likely to Adversely Affect c/
Green floater	*Lasmigona subviridis*	SC	Adverse impacts are not likely c/
James spinymussel	*Pleurobema collina*	E	Not Likely to Adversely Affect c/
Yellow lampmussel	*Lampsilis cariosa*	SC	Adverse impacts are not likely c/
Plants			
Small whorled pogonia	*Isotria medeoloides*	T	Not Likely to Adversely Affect
Smooth coneflower	*Echinacea laevigata*	E	Not Likely to Adversely Affect

Sources: NCNHP, 2016; NCNHP, 2017; NCWRC, 2015; Roble, 2016; Townsend, 2018; VADGIF, 2015.

a/ Nine additional listed species were noted by federal and state agencies as potentially being present in the Project counties; however, the species are not known to occur in the portions of the counties that would be crossed by the Project and they are therefore not listed in this table. The species are listed here: Cape Fear shiner (*Notropis mekistocholas*), eastern big-eared bat (*Corynorhinus rafinesquii macrotis*), eastern small-footed bat (*Myotis leibii*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii rafinesquii*), Schweinitz's sunflower (*Helianthus schweinitzii*) southeastern bat (*Myotis austroriparius*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and yellow lance (*Elliptio lanceolata*).

b/ E = Listed Endangered; T = Listed Threatened; PT = Proposed Threatened; SC = Species of Concern

c/ Pending results of mussel surveys in North Carolina.

4.7.2 Mammals

4.7.2.1 Northern Long-eared Bat

The northern long-eared bat is federally threatened and state threatened in Virginia. The current range includes Pittsylvania County but does not extend into Rockingham or Alamance Counties (FWS, 2019). It hibernates during the winter in small crevices and cracks within caves and mines with constant temperatures, high humidity, and no air currents. In the summer, the northern long-eared bat roosts singly or in colonies beneath the bark or in cavities or crevices of live and dead trees (snags). Males and non-reproductive females may also roost in caves or mines during the summer. As previously described, the Project would involve the clearing of forest, which has the potential to affect sensitive bat species and their habitat, including roosting trees and hibernacula. Generally, construction activities and noise/vibrations from equipment also has the potential to disturb nearby roosting and hibernating bats.

In January of 2016, the FWS finalized a rule under authority of Section 4(d) of the ESA that provides measures that are necessary and advisable to provide for the conservation of the northern long-eared bat. The rule prohibits purposeful take[18] of the species throughout its range except to remove it from human structures or to otherwise protect human health or property. The rule generally allows incidental take of northern long-eared bats in Virginia[19] but prohibits incidental take in the following circumstances:

- actions are prohibited if they cause take of bats within the hibernacula or alter the environment of a hibernacula in a manner that causes incidental take;
- tree removal activities are prohibited at any time of year within 0.25 mile of the entrance/exit of a known, occupied hibernacula; and
- tree removal activities are prohibited from destroying a known, occupied maternity roost tree, or any tree within a 150-foot radius of a maternity roost tree, between June 1 and July 31 (all tree removal activities may resume outside of this date range, including removal of the maternity roost tree).

No hibernacula or maternity roots are known to be present in the vicinity of the Project. However, the FWS requested that Mountain Valley conduct surveys in the Project area to augment bat occurrence data in this region. Mountain Valley conducted desktop and targeted field surveys for bats in 2018. Mountain Valley's *Bat Survey Study Plan* was approved by the FWS, VADGIF, and NCWRC in July of 2018 and Mountain Valley conducted targeted mist net and acoustic surveys during July and August of 2018. No federally listed bat species were documented during these surveys in Virginia or North Carolina.

Mountain Valley also began searches for bat portals (entrances to hibernacula) in the vicinity of the Project area in 2018. No potential hibernacula were documented during these portal surveys, but not all of the Project route has been surveyed to date. Mountain Valley will continue portal surveys in 2019 and provide subsequent reports to FWS, VADGIF, NCWRC, and FERC upon completion. Due to the lack of hibernacula and maternity roosts in the survey area, and if no additional individuals, hibernacula, or maternity roosts are located during additional surveys, with the application of the 4(d) rule for this species, we find that the Project *may affect but is not likely to adversely affect* the northern long-eared bat.

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18 From Section 3(18) of the Federal Endangered Species Act: "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

19 Virginia and North Carolina are within the portion of the United States that is designated under the final 4(d) rule as the white-nose syndrome (WNS) zone (i.e., U.S. counties within 150 miles of positive counties/districts containing WNS-infect hibernacula). As of May 31, 2018, the WNS zone encompassed the entire northeast, upper Midwest, and much of the southeast United States (FWS, 2018b). WNS is a fungal disease that affects many hibernating U.S. bat species. WNS has resulted in 90 to 100 percent mortality in bats affected by the disease in the eastern United States. The final 4(d) rule allows incidental take outside of the white-nose syndrome zone and specifies conditions in which incidental take is prohibited inside of the zone.

4.7.3 Fish

4.7.3.1 Roanoke Logperch

The Roanoke logperch (*Percina rex*) is federally endangered and state-endangered in Virginia and North Carolina. It is known to occur in Pittsylvania County in Virginia and Rockingham County in North Carolina (FWS, 2019). Roanoke logperch typically exist in low-density populations and inhabit medium-to-large sized warm, clear streams and small rivers of moderate to low gradient. Adults usually occupy riffles, runs, and pools containing sand, gravel, or boulders that are free of silt. Young-of-year congregate in mixed-species schools in shallow habitat underlain by sand and gravel along stream margins (FWS, 2015).

The Project would cross three waterbodies in Rockingham County that are known to contain Roanoke logperch (Dan River, Cascade Creek, and Wolf Island Creek). Roanoke logperch are not known to occur in any of the waterbodies that would be crossed by the Project in Virginia and the FWS and VADGIF advised Mountain Valley that fish surveys within waterbody crossings in Virginia would not be required (VADGIF, 2019b). The greatest potential impact on Roanoke logperch would be from in-water work that would result in turbidity and downstream sedimentation in streams that contain suitable habitat. Mountain Valley is currently proposing to use HDD to cross the Dan River and conventional bore techniques to cross Cascade and Wolf Island Creeks, both of which would avoid any direct impacts on the waterbody and aquatic habitat. As noted in section 4.6, Mountain Valley continues to consult with federal and state agencies regarding waterbody crossing restrictions. Mountain Valley has developed an *HDD Contingency Plan* detailing methods it would follow to reduce the likelihood of an inadvertent return affecting aquatic habitat or minimize the impacts associated with a potential drilling fluid release within a waterbody. We find this Plan acceptable. Section 4.6.6.2 and section 4.3.2.2 discuss the impacts on aquatic species from conventional bores and HDD crossing methods and the steps Mountain Valley would take to minimize such impacts.

In general, upland construction has the potential to result in additional sedimentation in watersheds that contain Roanoke logperch. Additional sedimentation has the potential to alter Roanoke logperch habitat and result in adverse impacts on individuals (see section 4.6.6.1). During construction, Mountain Valley would implement erosion and sediment control measures in Mountain Valley's Procedures and E&SC Plan, which includes BMPs such as using sediment barriers and mulch along sloped sections of the construction right-of-way to minimize sediment runoff into nearby streams. As noted in section 4.6.5.3, Mountain Valley is conducting an analysis of indirect sedimentation, which would be included with its mussel survey reports**.**

Given the methods proposed to cross these waterbodies, and Mountain Valley's planned measures to prevent erosion and runoff into streams and protect aquatic habitat from the potential negative effects of an inadvertent return, we have determined the Project *may affect but is not likely to adversely affect* the Roanoke logperch.

4.7.4 Mussels

4.7.4.1 James Spinymussel

The James spinymussel is federally endangered and state-endangered in Virginia and North Carolina (FWS, 2019; NCNHP, 2016; Roble, 2016). It is a small mussel (less than 3 inches in length) found in clear, free-flowing streams that are free of silt (FWS, 2019). The James spinymussel is only known to occur in Rockingham County, in the Dan River and its tributaries (FWS, 2019).

4.7.4.2 Atlantic Pigtoe

The Atlantic pigtoe is proposed for listing as threatened under the ESA and is listed as state threatened in Virginia and state-endangered in North Carolina (FWS, 2019; NCNHP, 2016; Roble, 2016). Critical habitat is also proposed for the species in Virginia and North Carolina including within the Dan River; however, the Project would not cross the portion of the Dan River that is proposed as critical habitat nor any of the other waterbodies proposed (FWS, 2019). The Atlantic pigtoe is a small (less than 2 inches in length) mussel typically found in gravel and coarse sand in silt-free, moderate-flowing creeks and rivers (FWS, 2018e). It has been documented in Pittsylvania, Rockingham, and Alamance Counties but, as indicated by the proposed critical habitat locations, it is not known to occur in the sections of waterbodies that would be crossed by the Project (FWS, 2019).

4.7.4.3 Green Floater

The green floater is a federal species of concern and is listed as state threatened in Virginia and endangered in North Carolina (FWS, 2019; NCNHP, 2016; Roble, 2016). It is a small mussel (less than 2 inches in length) found in sand and gravel substrates of clean, calm portions of streams and rivers (NCWRC, 2019b; VADGIF, 2015). It has been documented in Pittsylvania and Rockingham counties but is not known to occur in waterbodies crossed by the Project (FWS, 2019; NCWRC, 2019b).

4.7.4.4 Yellow Lampmussel

The yellow lampmussel is a federal species of concern and is listed as a state species of very high conservation need in Virginia and endangered in North Carolina (FWS, 2019; NCNHP, 2016; Roble, 2016). It is not known to occur in Pittsylvania County (FWS, 2019) but has been recorded in Deep Creek in Alamance County upstream of the proposed Project crossing (NCWRC, 2018c). The yellow lampmussel occurs in many different habitat types; however, it is most often found in sandy substrate downstream of large boulders in medium sized rivers and medium-to-large sized creeks with relatively fast flow (NCWRC, 2019c).

4.7.4.5 Mussels Summary

Mountain Valley conducted surveys in spring 2019 for freshwater mussels consistent with FWS and NCWRC guidance and the VADGIF Draft Freshwater Mussel Survey Guidelines for Virginia. No listed or sensitive mussels were documented in Pittsylvania County (ESI, 2019).

Mountain Valley has yet to file with the Commission the results of the mussel surveys conducted in Rockingham and Alamance Counties. If listed or otherwise sensitive mussel species were documented during 2019 surveys, Mountain Valley will consult with the FWS regarding appropriate avoidance and minimization measures to implement for the Project.

Impacts on mussels could result from turbidity and habitat alteration from in-water work and sedimentation caused by runoff from upland construction. These potential impacts are more fully described in the aquatic and fisheries discussion in section 4.6.6. Mountain Valley would attempt to avoid impacts on federally listed mussels from in-water construction in the Dan River by using the HDD crossing method and in Deep Creek by using conventional bore to install the pipeline. Mountain Valley's *HDD Contingency Plan* details methods it would follow to reduce the likelihood of an inadvertent return affecting aquatic habitat or minimize the impacts associated with a potential drilling fluid release within the Dan River. Section 4.3.2.2 discusses the impacts on aquatic species from conventional bores and provides steps Mountain Valley would take to minimize such impacts. Mountain Valley would further reduce potential impacts on freshwater mussels by implementing measures in FERC's Plan and Mountain Valley's Procedures and E&SC Plan. These include restricting in-water construction to between June 1 and November 30 of any given year[20] and measures to minimize downstream sedimentation and turbidity associated with construction in uplands and at the waterbody crossings, which can lead to, among other things, smothering of mussels (see section 4.6.7.1). With implementation of these measures, and if no mussels are reported in the survey results, we determine that the Project *may affect, but is not likely to adversely affect* the James spinymussel and the Atlantic pigtoe. We also determine that adverse impacts on the green floater and yellow lampmussel are unlikely.

4.7.5 Plants

4.7.5.1 Small Whorled Pogonia

The small whorled pogonia (*Isotria medeoloides*) is federally endangered, state-endangered in Virginia, and threatened in North Carolina. It is a member of the orchid family and occurs on upland sites in mixed-deciduous or mixed-deciduous/coniferous forests that are generally in second- or third-growth successional stages. Where it is found, populations are typically small, consisting of less than 20 plants (FWS, 1992).

Correspondence with the FWS indicated small whorled pogonia might be present within the Project area in Rockingham and Alamance Counties and recommended that Mountain Valley conduct surveys for the species (FWS, 2018c, 2018d). If small whorled pogonia occurs in the Project right-of-way, it could be vulnerable to removal during clearing and grading, or trampling and crushing by foot traffic or movement of heavy machinery. Right-of-way clearing could also adversely affect small whorled pogonia habitat by altering light exposure or hydrology or by increasing sedimentation and runoff in the vicinity of the right-of-way. The nearest documented occurrence to the Project area is in Guilford County, North Carolina (NCNHP, 2019a). Mountain Valley identified approximately 271 acres of potentially suitable habitat in the Project area using

[20] June 1 through November 30 is the FERC mandated warmwater habitat construction window; in-water work, except that required to install or remove equipment bridges, must be completed between these dates unless expressly permitted or further restricted in writing on a site-specific basis by the appropriate federal or state agency.

desktop Geographic Information System (GIS) analysis and soils data. Mountain Valley conducted field surveys for small whorled pogonia in 2018, but surveys were conducted outside of the optimal survey window for the plant. Therefore, Mountain Valley documented where suitable habitat may occur and will conduct surveys at these locations in 2019 during the appropriate survey window (June). If surveyors document the presence of small whorled pogonia during the 2019 surveys, Mountain Valley will consult with the FWS regarding appropriate avoidance and minimization measures to implement for the Project. Due to Mountain Valley's commitment to follow minimization measures required by FWS if individuals are found during June 2019 surveys, we conclude the Project *may affect but is not likely to adversely affect* the small whorled pogonia.

4.7.5.2 Smooth Coneflower

The smooth coneflower (*Echinacea laevigata)* is federally listed as endangered and state-listed as threatened in Virginia and endangered in North Carolina. It generally occurs in well-drained soils of open woods, cedar barrens, roadsides, clearcuts, utility line rights-of-way, and dry limestone bluffs (FWS 1995). This species is not known to occur in Virginia Project areas but may be present in North Carolina, as it has been previously documented in Rockingham County (FWS, 2019; NCNHP, 2019a).

The FWS recommended surveys for the smooth coneflower along the North Carolina portion of the Project area (FWS, 2018d). As with small whorled pogonia, smooth coneflower could be vulnerable to removal during clearing and grading, or trampling and crushing by foot traffic or movement of heavy machinery. Right-of-way clearing could also adversely affect smooth coneflower habitat by altering light exposure or hydrology or by increasing sedimentation and runoff in the vicinity of the right-of-way. Mountain Valley identified approximately 88.3 acres of potentially suitable habitat in the Project area using desktop GIS and soils data. Mountain Valley conducted field surveys for smooth coneflower and its habitat in 2018; however, Mountain Valley was not able to survey all areas with potentially suitable habitat due to a lack of land access. Therefore, Mountain Valley plans to complete surveys for smooth coneflower in June of 2019. If surveyors document the presence of smooth coneflower during the 2019 surveys, Mountain Valley will consult with the FWS regarding appropriate avoidance and minimization measures to implement for the Project. Due to Mountain Valley's commitment to follow minimization measures required by FWS if individuals are found during June 2019 surveys, we conclude the Project *may affect but is not likely to adversely affect* the smooth coneflower.

4.7.6 Federally Listed Threatened, Endangered, and Other Species of Concern Conclusions

Our determinations of effects described above are based on current information available for the species in the Project area. To date, Mountain Valley has not completed surveys or provided survey results to the Commission for federally listed bat hibernacula, aquatic biota, and plant species along the Project survey corridor. Therefore, **we recommend that**:

- **Mountain Valley should <u>not begin</u> construction activities <u>until</u>:**

a. **the staff receives comments from the FWS regarding the proposed action;**

b. **the staff completes ESA consultation with the FWS; and**

c. **Mountain Valley has received written notification from the Director of OEP that construction or use of mitigation may begin.**

4.7.7 State-Listed and Special Concern Species

As identified in table 4.7-2, 13 species listed as either endangered or threatened in Virginia and/or North Carolina were identified as occurring or potentially occurring in the Project area. Eight of these are federal species and were previously discussed. An additional 15 species are identified as rare, significantly rare, species of concern, or species of greatest conservation need in Virginia and/or North Carolina. In Virginia, species classified as rare or species of greatest conservation need do not have any legal status and are not afforded state protections. Similarly, in North Carolina, the NCWRC requires monitoring of species of special concern but there is no legal protection from take for these species. Nonetheless, Mountain Valley is currently consulting the Virginia and North Carolina resource agencies regarding survey recommendations or avoidance and minimization measures for the different tiers of state-listed species.

TABLE 4.7-2

State-Listed Fish, Plant, and Wildlife Species Occurring or Potentially Occurring in the Southgate Project Area

Common Name	Scientific Name	Status: Virginia a/	Status: North Carolina b/
Mammals			
Eastern red bat	*Lasiurus borealis*	W(IV)	
Eastern small-footed bat	*Myotis leibii*	W(I) **c/**	SC,SGCN **c/**
Northern yellow bat	*Lasiurus intermedius*		SC, SGCN **c/**
Hoary bat	*Lasiurus cinereus*	W(IV)	
Little brown bat	*Myotis lucifugus*	E **c/**	SR, SGCN
Northern Long-eared bat	*Myotis septentrionalis*	T	SR, SGCN
Silver-haired bat	*Lasionycteris noctivagans*	W(IV)	
Tri-colored bat	*Perimyotis subflavus*	E	SR, SGCN
Fish			
Riverweed Darter	*Etheostoma podostemone*		SC
Roanoke logperch	*Percina rex*	E	E, SGCN
Amphibians			
Four-toed salamander	*Hemidactylium scutatum*		SC, SGCN
Mole salamander	*Ambystoma talpoideum*	W(II)	SC, SGCN
Mussels			
Atlantic pigtoe	*Fusconaia masoni*	T	E, SGCN **c/**

TABLE 4.7-2

State-Listed Fish, Plant, and Wildlife Species Occurring or Potentially Occurring in the Southgate Project Area

Common Name	Scientific Name	Status: Virginia a/	Status: North Carolina b/
Eastern Creekshell	*Villosa delumbis*		SR,SGCN
Eastern Lampmussel	*Lampsilis radiata*		T, SGCN
Green Floater	*Lasmigona subviridis*	T	E, SGCN
James Spinymussel	*Parvaspina collina*	E c/	E, SGCN
Savannah lilliput	*Toxolasma pullus*		E, SGCN c/
Yellow Lampmussel	*Lampsilis cariosa*	W(II)	E, SGCN
Arthropods			
Carolina ladle crayfish	*Cambarus davidi*		SR
Greensboro burrowing crayfish	*Cambarus catagius*		SC, SGCN
Plants			
American Bluehearts	Buchnera americana	R	
Cliff Stonecrop	Sedum glaucophyllum		SR
Downy phlox	Phlox pilosa	R	
Piedmont Barbara's-button	Marshallia obovate var. obovate	R	
Small whorled pogonia	Isotria medeoloides	E c/	T
Smooth coneflower	Echinacea laevigata	T c/	E

Sources: Townsend, 2018; Roble, 2016; NCNHP, 2016; NCNHP, 2017; VADGIF, 2015; and NCWRC, 2015

a/ Virginia Status. E = Listed Endangered; T = Listed Threatened; R = Rare, including both Critically Imperiled and Imperiled state ranking; W (I) = Wildlife Action Plan, Tier I; W (II) = Wildlife Action Plan, Tier I; W (III) = Wildlife Action Plan, Tier III; W (IV) = Wildlife Action Plan, Tier IV

b/ North Carolina Status. E = Listed Endangered; T = Listed Threatened; SC = Species of Special Concern; SR = Significantly Rare; SGCN = Species of Greatest Conservation Need as listed in the Wildlife Action Plan

c/ Species not known to occur within the Project area (by State).

4.7.7.1 Mammals

Eight state-listed species of bats (including the federally threatened northern long-eared bat) potentially occur within the Project area. The little brown bat and tri-colored bat are both listed as endangered in Virginia. Each of the species potentially occur in Pittsylvania County and the eastern red bat, hoary bat, silver-haired bat, and tri-colored bat may also occur in Alamance and Rockingham counties. As noted in section 4.7.1, Mountain Valley conducted desktop and targeted field surveys for bats in Virginia and North Carolina in 2018. A single juvenile female tri-colored bat was captured during surveys in Virginia but otherwise no other state threatened or -endangered bat species were documented. No roost trees for tri-colored bats occur in the Project area. Mountain Valley will provide the full results of its surveys for hibernacula portals in 2019 and is continuing correspondence with the VADGIF to develop avoidance, minimization, or mitigation approaches to reduce potential impacts on state-listed bats and bat habitat. Given survey results thus far and that Mountain Valley remains in communication with the VADGIF regarding impact avoidance, minimization, and mitigation options for state-listed bats and bat habitat, we conclude the Project would not likely significantly impact state-listed bat species in Virginia or North Carolina.

4.7.7.2 Fish

Two state-listed fish species, the Roanoke logperch and the riverweed darter, potentially occur in the Project area. The Roanoke logperch is discussed in section 4.7.3. The riverweed darter is a species of special concern in North Carolina and is known to occur in Rockingham County within the Dan River watershed in clear, swift-flowing portions of waterbodies containing medium sized gravel, rubble, or small boulders, especially among rocks covered with riverweed (*Podostemum ceratophyllum*) (Tracy, 2014). The Project could affect the riverweed darter by altering suitable habitat during construction at waterbody crossings and through turbidity and downstream sedimentation in streams that contain the species. As noted in section 4.7.3, Mountain Valley would cross the Dan River using HDD and Cascade and Wolf Island creeks using conventional bore. The NCWRC notified Mountain Valley that it would not require fish surveys but requested that any state-listed species or species of greatest conservation need encountered during freshwater mussel surveys be reported (NCWRC, 2018c). Given Mountain Valley's planned approach to use HDD or conventional bore to cross the waterbodies that may contain state-listed fishes and its adherence to measures within its *HDD Contingency Plan* and the measures referred to in section 4.3.2.2 to minimize impacts from conventional boring, we conclude the Project would not likely significantly impact state-listed fish.

4.7.7.3 Amphibians

Two state-listed amphibian species, the four-toed salamander and the mole salamander, potentially occur in the Project area. Both are species of special concern and species of greatest conservation need in North Carolina (NCWRC, 2015). The mole salamander is also listed as a Tier II species (very high conservation need) in the Virginia Wildlife Action Plan (VADGIF, 2015). Mountain Valley continues to consult with the NCWRC and VADGIF regarding the necessity of surveys for four-toed and mole salamanders in the Project area. The four-toed salamander was historically known to occur in Alamance County and currently is known to occur in Rockingham County and is likely to occur in Pittsylvania County. Likewise, the mole salamander is known to occur in Rockingham and Pittsylvania counties. Though their local population levels are unknown, both species typically inhabit small wetland communities associated with headwaters in hardwood and mixed-species forests and seasonal (fish free) pools of floodplains within riparian forests (NCWRC, 2015; VADGIF, 2015). Potential effects of the Project on these species would primarily occur during construction in areas with suitable habitat. Clearing of vegetation could alter habitat conditions making certain areas unsuitable. Additionally, large equipment and vehicles could injure or kill individuals. Because these species are mobile, they would likely avoid construction areas. Construction activities would be temporary and Mountain Valley would restore temporary work areas in these habitat types to pre-construction conditions in accordance with FERC's Plan and Mountain Valley's Procedures. Although the Project could result in alteration of habitat and/or direct mortality of individuals unable to flee the work area, we conclude the Project would not significantly impact the mole and four-toed salamanders due to the short duration of construction activities in any one area and Mountain Valley's commitment to restore wetland and riparian areas to pre-construction conditions. Nonetheless, Mountain Valley continues to coordinate with the NCWRC and the VADGIF regarding the potential impacts of the Project on these two species.

4.7.7.4 Mussels

Three state-listed mussel species, in addition to the five federally listed species discussed in section 4.7.4, potentially occur in the Project area. The eastern creekshell and eastern lampmussel are both known to occur in Alamance County in the Haw River basin. The Savannah lilliput may also occur in the Haw River basin, but records for this species are very sparse. NCWRC requested that Mountain Valley include the Savannah lilliput as a species that could potentially be present within the Project area (NCWRC, 2018c). Potential impacts of the Project on mussels are described in section 4.7.4. As noted in 4.7.4, Mountain Valley conducted surveys in the spring of 2019 for freshwater mussels. No listed or sensitive mussels were documented in Pittsylvania County (ESI, 2019). Mountain Valley has yet to file with the Commission the results of the mussel surveys conducted in Rockingham and Alamance Counties. If surveyors in Rockingham and Alamance Counties documented state-listed mussels at proposed waterbody crossings, Mountain Valley will coordinate with NCWRC regarding avoidance options, potentially including relocating the mussels to a different suitable habitat location prior to commencing construction activities. Mountain Valley would further reduce potential impacts on freshwater mussels by implementing measures in FERC's Plan and Mountain Valley's Procedures and E&SC Plan. These include adhering to pertinent in-water work windows (see section 4.7.4.5) and measures that would minimize downstream sedimentation and turbidity associated with construction at the waterbody crossings, which can lead to, among other things, smothering of mussels. Therefore, we conclude that the Project would not likely significantly impact state-listed freshwater mussels.

4.7.7.5 Arthropods

Mountain Valley continues to consult with the NCWRC to determine the need for surveys of the two species of crayfish classified in North Carolina as significantly rare (Carolina ladle crayfish) and a species of special concern (Greensboro burrowing crayfish). The Carolina ladle crayfish occurs along the banks of freshwater creeks and streams under large rocks or in burrows and is thought to only exist in the eastern upper Piedmont Region of North Carolina (Cooper, 2000). It has been documented in Rockingham County within 6 miles of the Project area. The Greensboro burrowing crayfish occurs exclusively in burrows (i.e., it has never been documented in open surface waters) along stream banks and along floodplains within the Haw River basin (Cooper, 2010). It has not been documented in the counties crossed by the Project, but the full distribution of the species is unknown due to a lack of targeted surveys (NCWRC, 2018c). No crayfish surveys are expected to be required in Virginia. Mountain Valley conducted surveys in Rockingham and Alamance Counties for crayfish in 2019 in conjunction with its mussel surveys but has not filed the results of the surveys to date.

Potential effects of the Project include crushing of crayfish individuals and burrows by construction equipment and smothering of individuals and burrows by sediment runoff from the construction right-of-way. Mountain Valley would reduce potential impacts on crayfish species by implementing measures in FERC's Plan and Mountain Valley's Procedures and E&SC Plan, including narrowing the construction right-of-way at waterbody crossings, minimizing construction equipment crossings of waterbodies, and controlling sediment runoff from the construction right-of-way.

Although the Project could result in direct mortality of individuals we conclude the Project would not significantly impact the Carolina ladle crayfish and Greensboro burrowing crayfish due to the relatively limited area of direct impact at the waterbody crossings, the short duration of construction activities in any one area, and Mountain Valley's commitment to restore wetland and riparian areas to pre-construction conditions. With the implementation of the measures contained in FERC's Plan and Mountain Valley's Procedures and E&SC Plan, we conclude that the Project would not significantly impact the Carolina ladle crayfish or the Greensboro burrowing crayfish.

4.7.7.6 Plants

The VADCR-DNH (2018) identified three species of rare plants that have historically occurred near the Project area and for which potentially suitable habitat occurs in the vicinity of the Project along the entire proposed right-of-way: American blueheart (*Buchnera americana),* downy phlox (*Phlox pilosa)*, and Piedmont Barbara's-button (*Marshallia obovata)*. American blueheart occurs primarily along the edges of wet depressions, limestone glades, prairies, moist sandy soils, and open woods. Nine populations are documented in Pittsylvania County (VADCR-DNH, 2018). Downy phlox occurs in open areas, such as prairies and woodlands. Four populations are documented in Pittsylvania County. Piedmont Barbara's-button occurs in dry, open woodlands, roadsides, and pine savannahs. Five populations have been documented in in Pittsylvania County (VADCR-DNH, 2018).

The NCNHP (2018b) identified one state-listed rare plant species, cliff stonecrop (*Sedum glaucophyllum),* known to occur in Rockingham County. Cliff stonecrop is native to the Appalachian Mountains and grows on lightly shaded limestone outcrops in soils that are damp but well-drained. According to correspondence from NCNHP (2019b), construction of the Project would not impact any known populations of cliff stonecrop.

Mountain Valley continues to consult with the VADCR regarding the potential presence of American blueheart, downy phlox, and Piedmont Barbara's-button. Mountain Valley plans to conduct surveys for these species during the summer of 2019. Following guidance from VADCR, surveyors will target areas where the Project right-of-way could be collocated with existing maintained rights-of-way that provides open canopy habitat. Species present in the construction right-of-way could be vulnerable to removal during clearing and grading, or trampling and crushing by foot traffic or movement of heavy machinery. Mountain Valley would implement FERC's Plan and Mountain Valley's Procedures, E&SC Plan, and *Exotic and Invasive Plant Species Control Plan* to avoid or minimize impacts on these species if they are documented in the Project area. A final assessment of the potential impacts of the Project on these rare plant species is pending the outcome the 2019 surveys. In the absence of survey results, VADCR would not provide Mountain Valley with mitigation or minimization guidance beyond requesting that Mountain Valley avoid any areas that contain the plants (Mountain Valley, 2019).

4.7.7.7 Conclusions for State-Listed and Other Sensitive Species

Based on Mountain Valley's commitment to implement mitigation measures in FERC's Plan and Mountain Valley's Procedures and E&SC Plan, avoidance of sensitive habitat, and its consultations with the NCWRC and VADCR, we conclude that the Project would not significantly impact the state-listed bats, fish, salamanders, freshwater mussels, crayfish, and plants that may be present within the Project area.

4.8 LAND USE, SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Land Use

This section discusses the lands required to construct and operate the Project, the current use of those lands, crossings of recreational and special interest areas, and visual resources in the Project area.

Land uses crossed by the Project are generally classified into the following categories and definitions:

- agricultural: crop land, pasture/hay fields, and vineyards/orchards;
- forested/woodland: upland and conifer forests, and deciduous woodlands, forested wetlands;
- industrial/commercial: manufacturing or industrial plants, paved areas, landfills, mines, quarries, utilities, roads, railroads, and commercial or retail facilities;
- silviculture: wooded lands being managed for forest products (i.e., pine plantations);
- open land: utility rights-of-way, grasslands, range lands, scrub-shrub uplands, golf courses, and recreational (non-forested) land, scrub-shrub, and emergent wetlands, and unmanaged lands;
- residential: houses, farmsteads, apartments, mobile home parks, and residential subdivisions; and
- other: ponds, reservoirs, lakes, rivers, and streams.

Table 4.8-1 summarizes the amount of each land use that would be affected by constructing and operating the Project. Constructing the Project would impact 1,513.9 acres of land. Approximately 75 percent of this land would be utilized for the pipeline facilities, including the construction right-of-way (56.4 percent) and additional temporary extra workspace (18.3 percent). The remaining acreage affected during construction would be associated with contractor yards, access roads, and aboveground facilities and cathodic protection beds. Following construction, lands outside of the permanent right-of-way, extra workspace areas, contractor yards, and temporary access roads would be allowed to revert to previous land uses. The primary land uses affected by construction would be forested/woodland (39.9 percent) and open land (41.4 percent). Agricultural, silviculture, industrial/commercial, other and residential would make up the remaining 18.7 percent of land types affected during construction.

TABLE 4.8-1

Land Uses Affected by Construction and Operation of the Southgate Project (acres) a/ b/

Facility County, State	Forested Land		Open Land		Agricultural Land		Commercial / Industrial		Silviculture		Residential		Other		Total e/	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
H-605 Pipeline Right-of-Way c/																
Pittsylvania, VA	3.4	1.7	0.7	0.4	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	5.2	2.7
H-650 Pipeline Right-of-Way c/																
Pittsylvania, VA	141.7	70.5	103.7	49.5	51.7	25.9	2.6	1.3	1.5	0.7	2.8	1.2	1.3	0.0	304.4	148.9
Rockingham, NC	185.0	96.3	77.4	35.0	32.5	17.0	5.1	2.7	2.8	1.4	0.8	0.3	1.6	0.0	304.4	152.2
Alamance, NC	121.5	63.9	70.8	34.9	34.5	16.9	3.7	1.7	3.9	1.8	3.9	1.9	0.5	0.0	237.0	120.4
Pipeline Subtotal	***451.6***	***232.4***	***252.6***	***119.8***	***119.7***	***60.4***	***11.4***	***5.7***	***8.2***	***3.9***	***7.5***	***3.4***	***3.4***	***0.0***	***854.5***	***425.7***
Additional Temporary Workspace																
Pittsylvania, VA	45.1	0.0	30.9	0.0	15.4	0.0	<0.1	0.0	0.4	0.0	0.4	0.0	0.0	0.0	91.0	0.0
Rockingham, NC	55.6	0.0	26.0	0.0	24.7	0.0	0.2	0.0	0.0	0.0	0.7	0.0	0.0	0.0	96.4	0.0
Alamance, NC	30.2	0.0	30.3	0.0	13.7	0.0	0.5	0.0	1.8	0.0	1.2	0.0	0.0	0.0	76.1	0.0
ATWS Subtotal d/	***130.9***	***0.0***	***87.2***	***0.0***	***53.9***	***0.0***	***0.7***	***0.0***	***2.2***	***0.0***	***2.3***	***0.0***	***0.0***	***0.0***	***277.3***	***0.0***
Permanent Aboveground Facilities																
Lambert Compressor Station	5.1	4.4	1.3	1.0	12.7	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	11.7

TABLE 4.8-1

Land Uses Affected by Construction and Operation of the Southgate Project (acres) a/ b/

Facility County, State	Forested Land		Open Land		Agricultural Land		Commercial / Industrial		Silviculture		Residential		Other		Total e/	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
LN 3600 Interconnect	0.3	0.2	4.4	0.6	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	4.7	0.7
T-15 Dan River Interconnect	0.0	0.0	5.1	0.8	0.1	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.8
T-21 Haw River Interconnect	0.0	0.0	1.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.6
Aboveground Facilities Subtotal	***5.4***	***4.6***	***12.1***	***2.9***	***12.8***	***6.3***	***<0.1***	***<0.1***	***<0.1***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***30.4***	***13.9***
Contractor Yards																
Pittsylvania, VA	3.0	0.0	85.6	0.0	0.0	0.0	10.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.9	0.0
Rockingham, NC	0.0	0.0	12.4	0.0	0.0	0.0	18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.2	0.0
Caswell, NC	0.3	0.0	96.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.3	0.0
Alamance, NC	0.2	0.0	22.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.3	0.0
Contractor Yards Subtotal	***3.5***	***0.0***	***216.1***	***0.0***	***0.0***	***0.0***	***29.1***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***248.7***	***0.0***
Temporary and Permanent Access Roads																
Pittsylvania, VA	5.3	0.2	20.4	1.0	4.1	0.7	4.0	0.6	0.0	0.0	2.8	0.3	0.0	0.0	36.6	2.9

TABLE 4.8-1

Land Uses Affected by Construction and Operation of the Southgate Project (acres) a/ b/

Facility County, State	Forested Land		Open Land		Agricultural Land		Commercial / Industrial		Silviculture		Residential		Other		Total e/	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Rockingham, NC	3.4	0.0	26.3	2.9	4.0	<0.1	2.3	0.1	0.0	0.0	5.0	0.0	0.0	0.0	41.1	3.1
Alamance, NC	3.5	0.1	8.9	0.2	1.7	<0.1	5.0	0.1	0.6	0.0	1.5	0.0	0.0	0.0	21.2	0.3
Access Road Subtotal	***12.2***	***0.3***	***55.7***	***4.0***	***9.8***	***0.7***	***11.4***	***0.8***	***0.6***	***0.0***	***9.3***	***0.3***	***0.0***	***0.0***	***99.0***	***6.3***
Project Total e/ f/	**604.2**	**237.9**	**627.2**	**130.2**	**196.2**	**67.5**	**52.5**	**6.6**	**11.1**	**3.9**	**19.2**	**3.8**	**3.4**	**0.0**	**1,513.9**	**450.0**

Note: Pig launchers and receivers will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreages calculations for the pig launchers and receivers are included with those facilities. MLVs 1, 4, and 8 will be within other aboveground facility sites (i.e., the Lambert Compressor Station, T-15 Dan River Interconnect, and T-21 Haw River Interconnect), therefore, acreage calculations for MLVs 1, 4, and 8 are included with those facilities.

a/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Project (i.e., facility operation footprint and 50-foot pipeline permanent right-of-way). The 50-foot-wide permanent right-of-way between HDD entry and exit points and within railroad rights-of-way are not included in this acreage.

b/ Includes only the operation footprint of the Project facilities, the 50-foot-wide permanent pipeline right-of-way in uplands, except in wetland areas where the operation width has been reduced to 10 feet in emergent wetlands, scrub-shrub wetlands, and within 25 feet of waterbodies; and 30 feet in forested wetlands. The 50-foot-wide permanent right-of-way between HDD entry and exit points and within railroad rights-of-way are not included in this acreage.

c/ Includes the 50-foot-wide permanent right-of-way and temporary workspace areas.

d/ Includes ATWS areas for the pipeline facilities. ATWS areas to be used for construction of aboveground facilities are included in the acreage calculations for the applicable aboveground facilities.

e/ Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

f/ Project totals includes 4.1 acres of temporary and permanent impacts associated with cathodic protection beds.

Operating the Project would permanently impact 450.0 acres. The permanent easement would account for 425.7 acres or 94.6 percent of land affected. The remaining 24.3 acres or 5.4 percent of permanent impact would be associated with aboveground facilities, cathodic protection beds, and permanent access roads.

4.8.1.1 Pipeline Facilities

Constructing and operating the pipeline would temporarily and permanently impact land uses. Mountain Valley proposes to generally use a 100-foot-wide construction right-of-way, consisting of 50 feet of permanent right-of-way and 50 feet of temporary construction workspace. In wetland areas, Mountain Valley proposes to use a 75-foot-wide construction right-of-way. Various ATWS would be used for Project construction, in addition to the construction right-of-way. As discussed in section 2.3.3, Mountain Valley identified several areas where site-specific conditions would require the use of extra workspace outside of the 100-foot-wide construction right-of-way. Based on our review of the site-specific conditions and identified workspaces, we find these to be acceptable. Additional discussion of these extra workspace areas is presented in section 4.4.4.

Where the pipeline would be collocated with existing pipelines or electric transmission lines, the construction right-of-way could consist of a portion of the existing, cleared permanent right-of-way and some additional new right-of-way (see table 2.3-1). The land retained as new permanent right-of-way would generally be allowed to revert to its former use, except for forested land as discussed below. Also, activities such as the construction of permanent structures, including houses, house additions, garages, patios, pools, or the planting of trees, would be prohibited. 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. Mowing would occur no more than once every 3 years, but a 10-foot-wide strip centered over the pipeline might be mowed annually. However, as discussed in section 4.6.1.4 annual mowing would not be allowed during bird nesting season.

Forested Land

Forest land that would be affected by the Project consists mainly of mixed-deciduous and evergreen forests (see section 4.5.1). About 582 acres of forested land would be cleared within the pipeline right-of-way and ATWS. Impacts on forest land would be long-term and permanent. Trees within temporary construction work areas would be cleared, but following construction, these lands would be allowed to naturally revert to forest through natural successional processes following construction; however, impacts on forest resources in these areas could take 30 or more years to return to pre-construction conditions. Following construction, the maintained portion of the right-of-way would be permanently converted to open land.

Silviculture

Mountain Valley has identified seven tracts containing pine plantations that would be affected by the Project. Similar to forest lands, impacts on pine plantations would be long-term and permanent. During construction about 10.5 acres of pine plantation would be cleared. If requested by the landowner, cleared trees would be placed at the edge of workspaces for use/removal by the landowner. Several landowners expressed concern about access to their pine plantations. Mountain Valley has committed to working with landowners to maintain property access. Landowners would need to coordinate with Mountain Valley to coordinate safe travel of heavy logging equipment across the right-of-way. Once construction is complete, areas not affected by permanent right-of-way (6.6 acres) would be allowed to be replanted; however, given that it typically takes 30 or more years for trees to mature, this would result in a long-term impact to these areas. During operation of the Project, trees within the permanent right-of-way would not be permitted to re-grow, resulting in a loss of future marketable timber for the life of the Project on 3.9 acres. However, Mountain Valley would compensate landowners for any temporary and permanently lost timber. Normal logging operations would be permitted to continue during operation of the Project.

Agricultural Land

Agricultural lands in the Project area are generally used for the production of crops including: tobacco, soybeans, sorghum, barley, oats, wheat and corn; forage production that includes: greenchop, grass silage, haylage and hay; vegetable production for potatoes and sweet potatoes; orchards, livestock and poultry (USDA Natural Agricultural Statistics Services, 2012). Prime farmlands and statewide important farmlands are addressed in section 4.2.2.7. Constructing the Project would temporarily preclude agricultural practices and could affect future crop productivity. Fields would generally be taken out of production for one growing season while the pipeline is constructed. Mountain Valley would compensate landowners for lost production and crop damages due to construction of the Project as negotiated with the landowners. Construction activities such as clearing, grading, trenching, stripping, and backfilling would potentially affect agricultural lands by causing soil erosion, damaging surface or subsurface irrigation or drainage systems, and by degrading fertile soils through mixing and compaction. These impacts could result in direct loss of crops or pasture, as well as reduced crop productivity in future planting seasons.

To avoid and minimize impacts on agricultural lands, Mountain Valley would implement numerous measures as identified in FERC's Plan including measures that address soil segregation, soil compaction, and irrigation systems and would adhere to all other applicable federal, state, and local permit requirements. Mountain Valley would compensate landowners for lost production and crop damages due to construction of the Project as negotiated with the landowners. Additionally, Mountain Valley would coordinate with landowners to ensure they have access to all agricultural areas outside of the right-of-way, including those areas across the right-of-way. Crops, other than trees, would be allowed to be cultivated within both the construction and permanent rights-of-way once construction has been completed. As such, unless the land is used for tree-related farming, no permanent change in land use or permanent reduction in the amount of land available for cultivation would be associated with the pipeline right-of-way. Mountain Valley would conduct post-construction monitoring to evaluate the recovery of revegetation. While issues such as compaction could result in impacts on crop yields if not properly mitigated, adherence to measures outlined in FERC's Plan would limit these impacts on the short-term. According to FERC's Plan, revegetation would be considered successful once the affected agricultural area has "crop growth and vigor" that is similar to adjacent undisturbed portions of the same field. With the implementation of Mountain Valley's impact avoidance and minimization measures and its commitment to compensate farmers for lost crops, impacts on agricultural lands would be minor.

During the scoping period, one landowner, Robert Pollock on tract VA-PI-099.000, identified his farm as a certified seed farm, and requested that Mountain Valley implement additional mitigation measures. As discussed in section 4.8.2, Mountain Valley would work with the landowner during easement negotiations to identify any specialized mitigation measures requested by the landowners. Additionally, Mountain Valley assessed a potential route variation within the tract to determine if a more environmentally preferable route could be identified (see section 3.4.3.3).

Open Lands

Open lands that would be affected by the Project include open fields, existing utility rights-of-way, herbaceous and scrub-shrub uplands, non-forested lands, emergent and scrub-shrub wetlands, and non-paved roads. Similar to agricultural lands, constructing and operating the Project would temporarily preclude activities on open lands. However, these impacts would be temporary and would be minimized by the implementation of FERC's Plan. Following construction, most open land would return to pre-construction conditions within 2 years.

Industrial/Commercial Land

Industrial/commercial land uses could be temporarily affected during construction of the pipeline Project by increased dust from exposed soils, construction noise, and traffic congestion. Mountain Valley would implement several mitigation measures to minimize impacts on commercial land uses including coordinating driveway crossings with business owners to provide access across the construction right-of-way, timing construction to avoid peak use, and expediting construction in these areas.

Mountain Valley would ensure access for emergency vehicles during road crossings by using temporary platforms across the pipeline trench as needed. Road surfaces would be restored as soon as practicable so that normal access could resume, and commercial land uses would be restored to pre-construction conditions, or as specified in landowner agreements.

As discussed in section 4.9.4, Mountain Valley has developed and would implement a *Residential Access and Traffic Mitigation Plan*.

Residential Land

As currently designed, 9.9 acres of residential land would be affected by construction of the pipeline portion of the Project. Following construction, 3.4 acres of residential land would be within the permanent pipeline right-of-way and would be subject to restrictions on planting large trees (over 15 feet) and the placement of certain structures. The remaining 6.5 acres of affected residential land would be restored to pre-construction conditions and would not be subjected to any restrictions. In restoring properties, Mountain Valley would adhere to FERC's Plan and any specific requirements identified by landowners agreed to during negotiations. In most cases, property owners would be able to use the permanent right-of-way as they did before construction as long as the use does not conflict with Project operation and the terms of the landowner's negotiated easement agreement. A more detailed discussion regarding residential lands can be found below in section 4.8.3.

4.8.1.2 Aboveground and Other Facilities

Mountain Valley would use 30.4 acres to construct the aboveground facilities. As described previously, table 4.8-1 summarizes the land uses affected by constructing and operating the aboveground facilities. The MLVs and pig launchers/receivers would be located within the pipeline permanent operational easement or would be within the foot print of other aboveground facilities. The erection of aboveground facilities would permanently convert existing land use to industrial/commercial land use and associated workspace would experience both short-term and long-term impacts.

4.8.1.3 Contractor Yards

Mountain Valley's eight proposed contractor yards would affect a total of 248.7 of acres of land. Of that total, 216.1 acres would be open land and 29.1 acres would be commercial or industrial land and 3.5 acres of forested land. Following construction, all of the yards would be restored and returned to their previous condition and land use. However, because forested areas can take 15 to 30 years to recover, impacts on forested lands would be long-term to permanent.

4.8.1.4 Access Roads

Mountain Valley proposes to use 167 (new or existing) roads to access construction workspace (see appendix B.4). Use of these roads would temporarily affect a total of about 127.2 acres of land and would permanently affect a total of about 9.8 acres of land. Of the 167 access roads that would be used during construction, 143 are existing roads. Mountain Valley stated that 137 of these roads would need improvements such as adding gravel, paving, grading, or widening. Mountain Valley would construct 24 new access roads to construct the Project, affecting about 4.3 acres of land. Following construction, all temporary access roads would be returned to pre-construction conditions unless otherwise negotiated with the landowner.

Mountain Valley would use 21 roads to operate the Project including 12 existing roads and 9 new roads. The use of these roads that would permanently impact about 6.3 acres of land.

4.8.2 Land Ownership and Easement Requirements

Pipeline operators must obtain easements from existing landowners to construct and operate authorized 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., extra workspaces, temporary access roads, contractor yards), or permanent, granting the operator the right to operate and maintain the facilities once constructed.

Mountain Valley would need to acquire new easements or acquire the necessary land to construct and operate the new pipeline. These new easements would convey both temporary (for construction) and permanent (no greater than 50-feet-wide for operation) rights-of-way to Mountain Valley.

An easement agreement between a company and a 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. Compensation would be fully determined through negotiations between Mountain Valley and the landowner. Mountain Valley identified that it has based its offerings on a market study conducted by a licensed real estate appraiser.

If an easement cannot be negotiated with a landowner and if the Project is approved by the Commission, Mountain Valley 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 acquire the property necessary to construct and operate its Project. This right would apply to all Project-related workspace covered by an approval, including the temporary and permanent rights-of-way, aboveground facility sites, contractor yards, access roads, and extra workspaces. Mountain Valley would still be required to compensate the landowner for the right-of-way and damages incurred during construction. However, the level of compensation would be determined by a court according to federal or state law.

4.8.3 Existing Residences, Commercial and Industrial Facilities, and Planned Developments

4.8.3.1 Existing Residential, Commercial and Industrial Facilities

As currently designed, about 19.2 acres of residential land would be affected by construction of the pipeline and use of access roads. Construction work areas would be within 50 feet of 60 residential structures (including homes, mobile homes, and cabins). In addition to these residential structures, 42 other associated structures such as sheds and barns, would be located within construction work areas. Mountain Valley would work with landowners to either protect, purchase or relocate structures within the proposed construction right-of-way. No occupied residences would be removed to construct the pipeline. Appendix E.2 lists residences and other associated structures within 50 feet proposed construction work areas.

Residences within 50 feet of construction work areas would be affected by equipment noise and vibration, potential access delays, potential impacts on septic systems, and other general construction inconveniences (dust). In addition to the previously described impacts, the driveways of several residences would be partially or wholly within the construction work area. In order to ensure access to these homes during construction, Mountain Valley would provide access through the safety fencing. As described previously, operation of the Project would preclude the placement of many permanent structures. In general, as the distance to the construction work area increases, the impacts on residences decrease.

Septic systems are self-contained, underground wastewater treatment systems that dispose of household wastewater on-site. Septic systems are common in rural areas, including those crossed by the Project. The locations of existing and planned septic systems are not available in a public database. Mountain Valley is conducting landowner interviews on all affected properties to identify septic systems. Landowner interviews, to date, have identified one septic tank and one septic tank water line within the Project workspace. The septic tank location would be avoided with an adjustment to the construction workspace. The water line cannot be avoided and would be protected with matting during construction.

Septic systems could be damaged by heavy equipment operating above the system or through accidental contact with machinery during excavation activities. Mountain Valley would attempt to avoid and minimize impacts on any septic systems in the construction workspace. Mountain Valley has provided minor pipeline deviations to avoid septic systems and would continue to work with landowners to avoid septic systems as they are identified. Specific alternative routes proposed to avoid septic systems thus far are detailed in section 3.0. If avoidance is not possible, Mountain Valley would work with individual landowners to relocate or replace septic systems prior to construction. In the event that a septic system is damaged during construction, Mountain Valley would repair or replace the septic system. Surveys are ongoing for septic systems in the Project area.

To reduce impacts on residences within 50 feet of construction work areas, Mountain Valley would implement numerous measures including:

- notifying residents in advance of construction activities;
- installing temporary safety fencing for at least 100 feet on either side of the residence and maintaining it while the trench is open;
- preserving as many trees and as much landscaping as possible;
- segregating topsoil where appropriate or as negotiated with landowner;
- maintaining utility service during construction activities;
- constructing only during daylight hours, except where special conditions require otherwise; and
- restoring lawn areas and landscaping after backfill.

Additionally, Mountain Valley prepared and would adhere to site-specific *Residential Construction Plans* (see appendix B.7) for 36 residential structures currently identified as within 25 feet of construction work areas (including those within the construction workspace) or where a plan was requested by a landowner or agency. Table 4.8-2 lists all occupied residences within 25 feet of construction workspace. A complete list of structures within 50 feet of the Project can be found in appendix E.2.

TABLE 4.8-2

Occupied Residences within 25 feet of Southgate Project Workspace a/

Milepost	Building Type	Occupied (yes/no)	Distance from workspace limit (feet)	Residential Construction Plan Number a/
Pittsylvania County, Virginia				
4.5	House	Yes	4	RSS-H650-024
Rockingham County, North Carolina				
32.5	House	Yes	20	RSS-H650-025
43.1	House	Yes	11	RSS-H650-039
44.1	House	Yes	3	RSS-H650-026
46.1	House	Yes	16	RSS-H650-027
Alamance County, North Carolina				
67.3	House	Yes	12	RSS-H650-028
67.3	House	Yes	18	RSS-H650-028
67.3	House	Yes	8	RSS-H650-028
69.6	House	Yes	6	RSS-H650-017
69.7	House	Yes	8	RSS-H650-018
72.9	Mobile Home	Yes	0	RSS-H650-036

a/ Residential Construction Plans are provided in appendix B.7.

Four of the residences listed in table 4.8-2 would be within 10 feet of the edge of construction workspace or new temporary access roads, due to the construction constraints along those portions of the Project route. Because of the increased potential for construction of the Project to disrupt these residences and to ensure that property owners have adequate input to a construction activity occurring so close to their homes, **we recommend that:**

- **Prior to the end of the draft EIS comment period, Mountain Valley shall file with the Secretary evidence of landowner concurrence with the site-specific residential construction plans for residences at MPs: 67.3, 69.6, 69.7, 72.9, where the pipeline construction right-of-way or a new access road would be within 10 feet of the residence, or file a plan to modify the workspace in these locations to provide at least 10 feet between the residences and the workspace.**

We have reviewed the site-specific plans, mitigation, and associated workspace justifications, and have found them acceptable. However, we encourage the owners of each of these residences to provide us comments on the plan specific for their property during the draft EIS comment period. Furthermore, 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. Mountain Valley has developed landowner complaint resolution process as part of its *Public, Stakeholder, and Agency*

Participation Plan that it would implement during Project construction and restoration. Mountain Valley would track all calls and/or emails that it receives including the individuals name and details of the issues or problems. Mountain Valley would contact the landowner to understand the issue and if possible, resolve the problem. Otherwise, the issue will be elevated to a Project representative, who will contact the landowner within 3 business days. All complaints and follow-up correspondence would be documented, and any action required to resolve the issue would be discussed with the affected landowner and/or complainant. We find these procedures to be acceptable and to ensure proper documentation of landowner concerns, we are recommending in section 5.2 that Mountain Valley file weekly reports with us to document complaints and resolution status.

Commercial structures in close proximity to pipeline construction could also experience short-term disruptions as a result of in-street construction, detours, or restricted access due to lane closures. These impacts and corresponding mitigation measures are discussed in more detail in section 4.9.4. Implementation of Mountain Valley's general construction methods for working near residences and commercial areas, such as boring of public roadways, avoidance of road closures, development of Mountain Valley's *Traffic Mitigation Plan*, and the landowner complaint resolution process would minimize disruption to residential and commercial areas to the extent practicable. With the implementation of the mitigation measures outlined in this section, as well as the implementation of the measures within the residential site-specific plans, we conclude construction impacts would be adequately minimized.

4.8.3.2 Planned Developments

Mountain Valley contacted local planning agencies and identified one planned residential and commercial development within 0.25 mile of the Project. The Granite Mill Project includes the redevelopment of an abandoned mill to include new apartments and commercial space. Mountain Valley proposed to use access road TA-AL-187, an existing road through the redevelopment site. The residential portion of the redevelopment project is expected to be complete in December 2019 and full completion of the commercial redevelopment is anticipated for the end of 2022. Mountain Valley stated it would work with the developer to identify any mitigation measures that may be needed during construction of the Project. Because use of this access road could negatively affect the new residences through heavy construction traffic, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Mountain Valley should file with the Secretary a feasibility assessment for constructing the Project without the use of access road TA-AL-187**.

4.8.4 Recreation and Special Interest Areas

The Project would not cross any federally designated or managed lands. The Project is outside of any Coastal Zone Management Act areas. However, portions of the Project would cross and would be located within 0.25 mile of state and municipal recreation or special interest areas (see table 4.8-3 below).

Construction of the Project could alter the visual character of a recreational or special interest area by removing existing vegetation and disturbing soils; these potential impacts are discussed in section 4.8.6. Construction could 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 hikers while using trails.

In general, impacts on recreational and special interest areas would be temporary and limited to the period of active construction, which typically would only last a few days to several weeks in any one area. These impacts would be minimized by implementation of FERC's Plan and Mountain Valley's Procedures. In addition, Mountain Valley has proposed specific mitigation measures and is continuing to consult with the owners and managing agencies of recreation and special interest areas regarding the need for specific construction mitigation measures.

Construction periods could coincide with a variety of hunting seasons in Virginia and North Carolina. Hunting may occur on public and private lands throughout the Project area. During construction, hunting would not be permitted within construction workspaces. Mountain Valley would coordinate with landowners regarding any conflicts with planned hunting activities. Additionally, all workers would be required to wear high visibility vests and hardhats. Workers would be trained regarding hunting season. Once construction is complete, all hunting activities would be permitted to resume. Impacts on hunting and hunting areas would be temporary and minor.

TABLE 4.8-3

State and Municipal Recreational and Special Interest Areas within 0.25 mile of the Southgate Project

Name of Area	Land Ownership and Management	MP	County	State	Pipeline Crossing Length (feet)	Distance From Project (feet)	Area Affected (Acres)		Crossing Method / Special Construction
							Constr	Oper	
Designated Banister River Segment / Future Blueway	State Designated	4.3	Pittsylvania	VA	N/A	1,162 feet southeast of MP 4.3	N/A	N/A	N/A
Banister River Future Blueway	Upper Reach Roanoke River Basin Association	4.9	Pittsylvania	VA	48	0	0.1	0.0	Dry Crossing – Dam-and-pump, Flume
Easement	Virginia Outdoors Foundation	14.1	Pittsylvania	VA	N/A	914 feet southeast of MP 14.0	N/A	N/A	N/A
Designated Sandy River Segment	State Designated	17.7	Pittsylvania	VA	85	0	0.2	0.0	Dry Crossing – Dam-and-pump Flume
Berry Hill Industrial Park	Pittsylvania Regional Industrial Facility Authority (i.e., Commonwealth of Virginia)	22.3 – 24.8	Pittsylvania	VA	12,952	0	37.7	14.5	Conventional open-cut
Dan River Trail / Nationwide Rivers Inventory	North Carolina Watercraft Trail	30.1	Rockingham	NC	N/A (HDD)	0	0.0	0.0	HDD
Conservation Easement	Piedmont Land Conservancy	37.7 – 38.0	Rockingham	NC	139	0	0.3	0.1	Conventional open-cut
Ace Speedway	Private	56.9	Alamance	NC	N/A	94 feet west of MP 56.9	N/A	N/A	N/A
AOI Study Area – Land being considered during the master planning process	North Carolina Division of Parks and Recreation	58.7	Alamance	NC	N/A	1,134 feet southwest of MP 58.7	N/A	N/A	N/A

TABLE 4.8-3

State and Municipal Recreational and Special Interest Areas within 0.25 mile of the Southgate Project

Name of Area	Land Ownership and Management	MP	County	State	Pipeline Crossing Length (feet)	Distance From Project (feet)	Area Affected (Acres)		Crossing Method / Special Construction
							Constr	Oper	
Mitigation Easement	North Carolina Division of Mitigation Services	60.7	Alamance	NC	N/A	551 feet north of MP 60.7	N/A	N/A	N/A
Planned Regional Trail	North Carolina Division of Parks and Recreation	68.6	Alamance	NC	Unknown	0	Unknown	Unknow n	Conventional open-cut
Planned Haw River Trail / Nationwide Rivers Inventory	Haw River Trail Partnership	69.9 – 73.1	Alamance	NC	N/A	190 feet west of MP 71.6	N/A	N/A	N/A
Mountains-To-Sea Trail	North Carolina Division of Parks and Recreation	69.8	Alamance	NC	N/A (convention al bore)	0	0.0	0.0	Conventional Bore
Challenge Golf Club	Private	70.0 – 71.3	Alamance	NC	N/A	440 feet west of MP 71.3	N/A	N/A	N/A
Haw River Sanitary District Facility	Town of Haw River	70.2	Alamance	NC	186	0	0.3	0.2	Conventional open-cut
Easement	North Carolina Clean Water Trust Fund	71.4 – 71.7	Alamance	NC	N/A	177 feet west of MP 71.6	N/A	N/A	N/A
Easement	North Carolina Clean Water Trust Fund	71.8	Alamance	NC	N/A	446 feet west of MP 71.8	N/A	N/A	N/A
Graham Paddle Access – Haw River Trail	City of Graham	72.9	Alamance	NC	N/A	421 feet northwest of ATWS 1692 near MP 72.9	N/A	N/A	N/A

4.8.4.1 Other Special Use Lands

Several trails and special use lands were identified as being within 0.25 miles of the Project, but not crossed by the Project. These include an area of interest (AOI) being studied by the North Carolina Division of Parks and Recreation, a planned Haw River Trail/Nationwide Rivers Inventory, a Virginia Outdoors Foundation easement, two North Carolina Clean Water Trust Fund Easements, a mitigation easement, and the Graham Paddle Access – Haw River Trail. These areas range from 170 feet to more than a 1,000 feet from the construction workspace. No direct impacts are anticipated to these areas due to construction. Some areas may experience minor noise, air, and visual impacts, depending on their proximity to the work areas. However, these would be temporary and minor.

The Dan River would be crossed by the Project near MP 30 and the Haw River would be within 0.25 mile of the Project. Both rivers are candidates to be added as a National Wild and Scenic River. However, Mountain Valley would cross the Dan River using an HDD; therefore, no impacts are anticipated on the Dan River or recreationalists who may use the river. There may be temporary noise or visual impacts on recreationalists using the river within close proximity to the Project; however, these impacts would be temporary (HDD typically takes 3 to 6 months to complete) and minor. The Haw River is 190 feet west of the Project, so we do not anticipate there would be impacts on the river or its users.

Segments of the Banister River are identified as a Virginia Department of Conservation and Recreation scenic river. The segment of the Banister River crossed by the Project at MP 4.9 is listed as a future Blueway (a designated recreational water trail). However, the current construction schedule anticipates that the Project would be complete prior to Blueway status. The Banister River would be crossed using a dry crossing method (e.g. dam-and-pump or flume). The Project would also cross the Sandy River at MP 17.7 using an open-cut dry crossing method. While there would be minor impacts on the rivers during construction, these impacts would be short-term with the implementation of Mountain Valley's Procedures for the stream crossing. Boaters would be temporarily restricted from traversing sections of a river during construction. Mountain Valley would notify users of any closings through websites, at upstream access areas, and/or using other methods based on recommendations from the VADCR and would establish a temporary path around the construction site for users of the rivers. The river crossings would take 3 to 7 days to complete. No boat ramps are within close proximity to the crossings. It is not anticipated that the river crossings would impact a significant number of boaters. Overall, the crossings of the Banister River and Sandy River is expected to have temporary minor impacts on recreational use. No impacts on the rivers would be expected during operation and Mountain Valley would restore the area and riparian vegetation crossed to pre-construction conditions except for a 10 foot-wide herbaceous strip over the centerline.

The Project would cross a planned regional trail in Alamance County, North Carolina at MP 68.6 using the open-cut method. No information was available on the timing of construction for the regional trail. However, if the trail is completed prior to the start of construction of the Project, impacts associated with the crossing would include temporary closure of the trail during the open-cut crossing (typically 3 to 7 days), construction noise and dust, and a visual change to trail users since the area is currently a mix of forest and open land. The effects on trail users would be limited to the period of active construction and would be minor. Permanent visual impacts associated with tree clearing is discussed further in section 4.8.6.

The Project would also cross the North Carolina state hiking trail, the Mountains-to-Sea Trail, at MP 69.8. At this crossing location, the trail is a paved road (Stone Street) in the town of Haw River. The trail/road would be crossed by conventional bore resulting in no direct impacts on the trail or its use. However, users would experience some impacts from construction noise and dust and visual impacts associated with personnel and equipment.

The Ace Speedway is 94 feet west of the Project right-of-way near MP 56.9. The facility hosts various events including stock car racing from March through September, as well as other special events and races throughout the year. A private gravel road provides access to the speedway from Altamahaw Racetrack Road. Mountain Valley would also use this road as a temporary access road (TA-AL-159A). Based on the Ace Speedway 2019 Racing Schedule, races typically take place on Friday and Saturday nights with gates opening at 4:00 pm (Ace Speedway 2019). As previously stated, a typical construction workday would end around 7:00 pm, on average. This would result in overlap for use of the road between construction crews and attendants of the speedway. Temporary effects on the facility include additional traffic along the access road that could result in delays for racers and attendants of the racetrack. Road maintenance may also be required more often due to Project-related equipment. In order to minimize impacts on the facility and its users, Mountain Valley would coordinate with the landowner regarding timing and use of the road. Mountain Valley would also maintain the road and restore it as necessary to maintain its condition.

The Challenge Golf Club is 0.1 mile west of MP 71.3 and Project-related impacts are not anticipated for the golf club. Temporary impacts on the golf club's viewshed would be minimal due to the contours of the area and surrounding vegetation.

In general, recreation areas and special use areas crossed by the Project are expected to experience some temporary impacts during construction, such as clearing of trees, noise, dust, and limited access which may prevent or curtail recreational activities. Users of these areas such as hikers, wildlife enthusiasts, sightseers, bikers, and other recreationalists may be prevented from use of the immediate area around the temporary right-of-way during construction. Nearby recreation areas and special use areas are expected to experience similar temporary impacts as areas are crossed, but as the distance to the construction work area increases, these impacts would generally decrease.

Mountain Valley would continue to consult with the appropriate federal, state, and managing agencies to develop and implement measures to mitigate and reduce impacts on these areas as needed. Direct access to some entry points within these areas may be temporarily limited or restricted due to increased traffic or road closures during construction. For further discussion of transportation impacts and mitigation measures, refer to section 4.9.4.

4.8.4.2 Specialty Crops

Several pine plantations were identified by Mountain Valley as being crossed by the Project and are discussed in section 4.8.1. Mountain Valley has not identified any specialty crop farms within the Project area.

4.8.5 Hazardous Waste Sites

Using data from the EPA, the VADEQ, and NCDEQ, Mountain Valley identified 30 sites of potential contamination concern within 0.25 mile of the Project[21]. None of the sites would be crossed by the proposed Project. The nearest site with an active or unresolved status is more than 400 feet from the Project workspaces. While Mountain Valley does not anticipate any concerns associated with the hazardous sites, if any hazardous materials are encountered during construction, Mountain Valley would implement its Project-specific SPCC Plan and *Unanticipated Discovery of Contamination Plan*. See section 4.2.7 and 4.3.1.5 for a more detailed discussion of potential hazardous waste sites.

4.8.6 Visual Resources

Visual resources represent the aesthetic quality of the landscape as perceived subjectively by the viewer. Visual resources within the Project areas are a function of geology, climate, and historical processes, and include topographic relief, vegetation, water, wildlife, land use, and human uses and development.

4.8.6.1 Pipeline Facilities

Visual impacts associated with the construction right-of-way and extra workspaces include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, blasting (if required), and machinery and tool storage. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value (e.g. loblolly pines); the removal or alteration of vegetation that may currently provide a visual barrier; or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists; from residences within close proximity to the construction workspace or where vegetation used for visual screening or for ornamental value is removed; and viewsheds where the pipeline is routed through forested areas. Portions of the pipeline would be collocated or adjacent to existing pipeline and/or utility rights-of-way. As a result, the visual aesthetic along those portions of the Project route have been previously affected by other similar activities. As stated above, there are residences that would be within 25 feet of pipeline construction workspace (including access roads). Visual impacts on these residents would be more noticeable given their close proximity to construction activities,

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[21] The list of hazardous sites within 0.25 mile of the Project was included as part of Resource Report 8 in its November 6, 2018 application. The application can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

including clear views of equipment and personnel. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation to regenerate and would be prevented from re-establishing on the permanent right-of-way.

The areas that would be crossed by the pipeline are predominately agricultural land and forested lands. The duration of visual impact from clearing would be shortest in open areas where the re-establishment of vegetation following construction would be relatively rapid (generally less than 3 years). The duration would be greater in forested land, which would take many years or decades to regenerate. The forested setting would also help to minimize the number of visual receptors along the forested portion of the right-of-way. After construction, all areas disturbed by the pipeline would be restored, and areas outside of the permanent right-of-way would be returned to pre-construction conditions in compliance with federal, state, and local permits; landowner agreements; and Mountain Valley's easement requirements.

4.8.6.2 Aboveground Facilities

The most visible features of the Project would be the aboveground facilities. A typical compressor station would consist of five structures (compressor unit-turbines building, two electrical control buildings, air compressor building, and an office), pig launchers/receivers, electric utilities, lighting fixtures, graveled yard with piping, surrounded by a chain-link security fence. Interior yard equipment would include gas filter/separators, gas coolers, inlet air filters, exhaust silencers, tanks, blowdown silencers, hears, and auxiliary micro-turbines. The equipment at a typical interconnect and interconnection would consist of custody-transfer flow meter, pressure/flow regulator, over pressure protection, isolation block valves, and associated instrumentation and control devices. The meter runs would be within a graveled yard surrounded by a fence. There would also be an electric utility hook-up.

Most of the MLVs would be within the permanent right-of-way easement for the pipeline. Usually, the valves are buried, with aboveground extensions. The MLVs would be equipped with valve actuators for remote operation.

The new Lambert Compressor Station would be within an area that is currently a mix of agriculture and forested land. Once constructed, the compressor station would be surrounded by trees on three sides shielding the compressor station from public view. Additionally, there are no homes or major roadways within 0.5 mile of the station. The closest residence is about 0.6 miles southeast of the compressor station site. This residence would not have direct views of the site during construction or operation due to existing vegetation around the compressor station site and near the residence. There are several other homes southwest of the compressor station that are about 500 feet from the pipeline right-of-way. The compressor station would not be visible from these residences due to natural vegetative screening. Given that views of the compressor station would be limited and there are no direct views of the site from residences, construction of the compressor station is not expected to result in any significant permanent impacts on visual resources.

Out of the four new interconnects, one would be within the footprint of the Lambert Compressor Station and visual impacts would be the same as described above for the compressor station. The LN 3600 Interconnect would be constructed at MP 28.2 in an area that is currently open and forested uplands. The closest residence is about 0.7 mile southeast of the interconnect with forested vegetation preventing views of the interconnect from the residence. The Willow Oaks Plantation, a meeting and wedding venue site, is less about 0.2 mile north of the interconnect; however, existing forested vegetation would prevent any direct views of the Project facility. No significant visual impacts are anticipated from construction and operation of the interconnect. The T-15 Dan River Interconnect would be constructed near MP 30.4 within an area that is currently open land. There are two residences less than 0.1 mile south of the interconnect; however, the land use between is predominantly forested and would provide a natural visual screening of the interconnect site and it would not be visible to the residents. The interconnect is about 180 feet east of South Fieldcrest Road and would be visible to motorists along the road; however, there are several other developed areas adjacent to the interconnect site, and the addition of the interconnect site would not represent a significant change to the existing viewshed. The T-21 Haw River Interconnect at MP 73.1 would be constructed within open land, 160 feet south east of an existing industrial site, and adjacent to Route 54. There are two residences that could have direct views of the interconnect site. An additional residence is also across the road (about 250 feet north) from the interconnect site; however, that residence has an existing tree line screening it from the road and the proposed interconnect site. The first residence is about 180 feet to the east of the site. The existing terrain on the edge of the property will likely shield the interconnect site from being in direct view from the residence; therefore, no significant impacts are anticipated. The other home is across the road, about 310 feet northeast of the proposed location. Given the flat terrain of the area, and the lack of trees or other potential natural screens, this residence is likely to have direct views of the interconnect site and result in a minor change to the viewshed of the residents.

In general, the impacts on visual resources resulting from the construction and operation of the MLVs would be minimal as each site is small (typically less than 0.1 acre) and would be operated within the pipeline operational right-of-way or within a proposed aboveground facility (e.g., interconnect sites). MLVs along the operational right-of-way would be enclosed in a chain-link security fence. For ease of access, most of the MLV sites are near public roads and would be visible to passing motorists. However, given the small size of these sites, this change to the viewshed would be minor. One MLV site (MLV 6) near MP 55.1 would be within 400 feet of several residences, with the closest home about 140 feet to the east. Given the existing land use (agricultural and open land) and the existing terrain, the MLV site would be visible to these residences. However, the surrounding landscape also includes other homes, sheds, and residential fences. Therefore, the addition of the MLV is not likely to cause a significant visual impact.

4.8.6.3 Contractor Yards

The contractor yards would be located on agricultural, open, industrial, and forested lands. Minor grading and addition of gravel may occur at the contractor yards. Minor tree clearing would be required at two of the contractor yards (CY-03 and CY-09); however, these clearing activities would not represent a significant visual change. Contractor yards would be used to store trailers, vehicles, pipe, and other construction-related materials during construction. Eight of the ten yards currently proposed are in industrial areas or in areas away from any sensitive receptors; however, two of the contractor yards are in areas with nearby residences. There are four residences across the road from and with a direct view of the CY-22 site. There are two residences across the road about 200 feet south of the CY-19 site with direct view of the site. While residents would be able to observe the activities at these locations, the contractor yards would only be used during construction. Once construction is complete, the contractor yard sites would be returned to their pre-construction conditions. Therefore, any impacts associated with the contractor yards would be temporary and minor.

4.8.6.4 Access Roads

Most of the existing roads are currently paved, graveled, or have dirt surfaces and would require minor improvements, and would not have a significant impact on aesthetics. Several of the temporary access roads and permanent access roads that Mountain Valley proposes to construct or modify would require extensions of existing roads. Construction of these roads would require some tree clearing in addition to grading and graveling. Temporary access roads would be returned to pre-construction conditions unless another arrangement is mutually agreed upon with the landowner. For access roads that require tree clearing, there would be a long-term localized visual change to the landscape. Several access roads would be in close proximity to homes and the homeowners may notice an increase in traffic from construction vehicles, including worker vehicles are larger construction equipment.

Given the limited amount of clearing (12.2 acres) that would be needed, as well as the limited footprint (25 feet in width) of any single access road, and the temporary nature of increase traffic along these roads, we conclude that visual impacts from access roads would be minor.

4.8.6.5 Scenic Byways

The Project route would cross the Virginia Scenic Byway (Route 58) at MP 20.0 in Pittsylvania County. The byway would be crossed using a bore. Construction equipment and personnel would be visible to passing motorists during construction of the pipeline. While this would be a temporary impact, clearing of trees within the right-of-way and along the edge of the road would be a permanent change in the view by motorists traveling along the roadway. However, tree clearing would be adjacent to an open field; therefore, this change would be minor.

The Colonial Heritage Byway (Route 150) would be crossed at MP 48.4 in Rockingham County, North Carolina. The road would be crossed using a bore. Personnel and equipment would be visible to passing motorists during construction. A forested area about 190 feet from the roadway edge would be cleared for the pipeline right-of-way leading to the crossing, which would cause a long-term and permanent change to the viewshed visible to motorists traveling along the road. However, given the existing open areas, this would not represent a significant impact.

4.8.7 Land Use, Special Interest Areas, and Visual Resources Conclusions

Land use-related impacts associated with the Project would include the disturbance of existing uses within the rights-of-way during construction and maintenance of new permanent right-of-way for operation of the Project. Additional land would be disturbed by construction of the aboveground facilities, and land within the facility footprints would be permanently retained for operation. The primary land use types affected would be forested, agricultural land, and open lands. In forested areas, trees and shrubs would be removed from the construction work areas and the maintained portion of the right-of-way would be permanently converted to a non-forested condition. Land outside of the permanent pipeline easement would be allowed to revert to its prior condition, although this process would take many years. Impacts on agricultural lands would be short-term and limited to the growing season concurrent with construction. Following construction, agricultural practices within the pipeline right-of-way would be allowed to resume. Impacts on open land areas would be temporary and short-term, and would be minimized by the implementation of Mountain Valley Plan. Open land areas within the temporary and permanent right-of-way are expected to revert to their pre-construction land use after completion of construction. However, some activities, such as the building of new structures, would be prohibited on the permanent right-of-way.

4.9 SOCIOECONOMICS

Constructing and operating the Project may affect the socioeconomic character of communities near the proposed facilities. These potential impacts include temporary population increases and new employment opportunities, increased demand for housing and public services, impacts on tourism and local businesses, transportation impacts, environmental justice, and revenues associated with sales and payroll taxes. For the purposes of our socioeconomic analysis, the Project area consists of the three counties crossed by the Project.

4.9.1 Population and Employment

Table 4.9-1 provides information on population levels and trends for counties that would be affected by Project.

TABLE 4.9-1

Population Levels and Trends in the Southgate Project Area a/

Project/Location	2017 Population Estimate	2010 Population Density (persons/sq. mi.)	Change in Population (2000-2010) Percent	Change in Population (2010-2017) percent
Virginia	**8,470,020**	**214.5**	**13.0**	**5.9**
Pittsylvania	61,258	63.2	2.9	-3.5
North Carolina	**10,273,419**	**211.3**	**18.5**	**7.7**
Rockingham	90,949	160.7	1.9	-2.9
Alamance	162,391	383.0	15.5	7.5

a/ U.S. Census Bureau, 2017a

Mountain Valley estimates that it would take 10 to 12 months to construct the Project and an additional 2 years to complete restoration. Mountain Valley estimates that the peak construction workforce would be 860 people for the pipeline and 185 people for construction of the aboveground facilities (see table 4.9-2). Mountain Valley estimates that 55 percent of the workforce would be local hires, while the remaining workforce would relocate from outside the Project area.

TABLE 4.9-2

Estimated Workforce for the Southgate Project

Construction Spread	County/State	Peak Construction Workforce	Peak Local Workers	Peak Non-local Workers
Pipelines				
Spread 1	Pittsylvania, VA Rockingham, NC	485	267	218
Spread 2	Rockingham, NC Alamance, NC	375	206	169
Pipeline Subtotal		*860*	*473*	*387*
Aboveground Facilities				
Lambert Compressor Station/Lambert Interconnect /MLV 1	Pittsylvania, VA	110	61	49
Interconnects **a/**	Rockingham, NC Alamance, NC	75	442	33
Aboveground Facility Subtotal		*185*	*103*	*82*
Project Total		***1,045***	***576***	***469***

a/ Mountain Valley estimates a workforce of about 25 workers per interconnect

We estimate that during construction there could be a maximum of 469 non-local workers that would relocate into the Project area. This represents a total population increase of less than 1 percent within the Project area. Due to the relatively short duration of Project construction, most non-local workers are not expected to bring their families with them to the Project area. Since the Project construction workers would be spread out along two separate pipeline spreads within three counties, we conclude that the Project would not have a significant effect on any one counties' population. Additionally, Mountain Valley would hire four new permanent employees to operate and maintain the Project facilities. The effects of these permanent employees would be minor in regard to population levels within the counties crossed by the Project.

In Virginia, the unemployment rate in Pittsylvania County (4.5 percent) is slightly higher than the state rate of 3.2 percent (BLS, 2018). In North Carolina, the unemployment rates in Rockingham County is higher than (5.2 percent) and Alamance County is equal to (4.3 percent) the state rate of 4.3 percent. During peak construction, up to 589 local workers could be employed on the Project. This represents 0.4 percent of the total civilian workforce in the affected counties. Given the short duration of construction, any increase in local employment rates from construction of the Project in these counties or the surrounding areas would be temporary and minor, and the Project is unlikely to noticeably affect local unemployment rates.

4.9.2 Housing

Based on U.S. Census Bureau data, there are about 3,213 units available for rent in the affected counties (U.S. Census Bureau, 2016b) and there is a vacancy rate of 3.6 percent in Pittsylvania County, 7.5 percent in Alamance County, and 8.9 percent in Rockingham County. In

2017, there were about 2,118 hotel and motel rooms and an additional 407 recreational vehicle (RV) and campground spaces available in the Project area (see table 4.9-3).

TABLE 4.9-3

Existing Housing Accommodations in the Southgate Project Area

Project/ County	Rental Vacancy Rate (percent) a/	Units Available for Rent b/	Units for Seasonal Recreation b/	Hotel/ Motel Facilities c/	Hotel/ Motel Rooms c/	RV and Campground Locations d/	RV and Campground Spaces d/
Virginia							
Pittsylvania	3.6	239	899	3	160	5	172
North Carolina							
Rockingham	8.9	1,197	1,165	15	603	4	147
Alamance	7.5	1,777	284	26	1,355	3	88
Project Total	***NA***	***3,213***	***2,312***	***44***	***2,118***	***12***	***407***

a/ US Census Bureau, 2016a
b/ US Census Bureau, 2016b
c/ HotelMotels.info, 2018; Bing Maps, 2018; Experience Danville Pittsylvania County, 2018; Visit Rockingham County, 2018; Visit Alamance County, 2018.
d/ Go Camping America, 2018; RV Clubs, 2018; Experience Danville Pittsylvania County, 2018; Visit Rockingham County, 2018; Visit Alamance County, 2018.

Mountain Valley would not provide or construct any housing during construction. Instead, non-local construction workers would find housing in vacant rental units, including houses, apartments, mobile home parks, hotels/motels, campgrounds, and RV parks. The influx of about 469 non-local construction workers would represent a 5.8 percent increased demand for available accommodations in the Project area. Local workers would not need housing, as they would commute from their existing homes. Given the relatively short duration of construction and the number of housing units available, we conclude that the Project would not have significant adverse impacts on housing.

4.9.3 Public Services

Constructing the Project would increase demands on local public services and facilities. Local police may be needed to assist in maintaining traffic flow during construction or may need to respond to emergencies associated with pipeline construction. Fire departments may be needed in response to Project-related emergencies. Increased need for medical services would be mainly due to any illness or injury of workforce personnel. Additionally, police, fire, or medical service needs may also increase due to the influx in personnel (e.g. increase in traffic stops, traffic accidents). Table 4.9-4 summarizes the medical, police, and fire protection facilities in the counties within the study area.

TABLE 4.9-4 **Public Services in the Counties Affected by the Southgate Project**				
Project/State/ County	**Number of Fire Departments a/**	**Number of Hospitals / Hospital Beds b/**	**Number of Police & Sheriff Departments c/**	**Number of Public Schools d/**
Virginia				
Pittsylvania	21	1 / 50	3	19
North Carolina				
Rockingham	16	2 / 339	6	25
Alamance	8	1 / 238	6	36
Project Total	**45**	**4 / 627**	**15**	**80**

a/ Pittsylvania County Schools, 2018; Rockingham County Schools, 2018; Alamance County Schools, 2018.
b/ Pittsylvania County Sheriff, 2018; Rockingham County Sheriff, 2018; Alamance County Sheriff, 2018.
c/ USA Fire & Rescue, 2018; Carolinas Fire Page, 2018; Pittsylvania County GIS, 2018; Pittsylvania County, 2018.
d/ AHD (American Hospital Director), 2018.

All of the counties affected by the Project contain areas that are designated as health professional shortage areas (HPSA) and as medically underserved areas/populations (MUA/P). HPSA or MUA/P designation indicates a shortage of health care professionals or facilities (primary care, dental, and mental health) at either the county level as a whole or for particular census tracts within the county that contain low-income populations who are underserved by primary medical care. There are several larger metropolitan areas in adjacent counties such as Martinsville, Virginia, Dansville, Virginia, and Greensboro, North Carolina that have additional hospitals and medical facilities and are within a 40 to 60 minute drive from the Project. Given the number of hospital beds available in the Project area and the surrounding areas, there are sufficient medical services to serve the proposed peak construction workforce of 1,045 workers.

Each county within the Project area has numerous fire and police departments. Mountain Valley would work with local fire departments, police departments, and emergency first responders to address any Project impacts.

Few non-local workers are expected to relocate their families to the Project area. Given the low number of children expected to relocate, local schools should be able to absorb any additional children moving to the area because of the Project.

The communities in the Project area have adequate public service infrastructure to meet the potential needs of non-local workers who relocate temporarily. Therefore, we conclude that the Project would not significantly impact public services.

4.9.4 Transportation and Traffic

Constructing the pipeline route would require crossing 74 public roadways and 4 railroads. A complete list of roads and railroads affected by the Project, including proposed crossing methods, is provided in appendix E.1.

Most paved roads and all railroads crossed by the Project would be crossed by conventional bore. Where roads are bored, impacts on users would be minimal since there would be no direct impacts on the road surface. Some gravel or grass/dirt two-track roads crossed would be open-cut (see appendix E.1). Use of the open-cut method across a road generally requires a temporary road closure and establishment of detours. If no detour is feasible, Mountain Valley would create temporary travel lanes or install steel plates over the open-cut area to ensure continued traffic flow during construction. At least one lane of the road being crossed would be kept open to traffic except for brief periods when it would be essential to close the road to install the pipeline. Mountain Valley 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. Mountain Valley would also employ traffic control measures, such as flagmen and signs. After pipeline installation, all roads crossed would be returned to their pre-construction condition and use.

Construction impacts on Project area roads would include disruption to traffic flow due to the movement of construction equipment, materials, and crew members and damage to local roads from the movement of heavy construction equipment and materials. Additionally, traffic and commute times may increase due to construction of the Project. The primary impact would occur as workers and equipment move into the Project area at the beginning of the day and leave the area at the end of the day. Specifically, slow moving or large construction equipment may cause delays throughout the day when moving into the Project area or moving between sites; however, these delays would be temporary. Public roads used by construction vehicles to get to and from workspaces could experience increase sediment tracking/build-up and surface damage. Mountain Valley would minimize and mitigate the trackout of sediment from the access roads or workspaces onto paved roads using rock construction entrances. If sediment or other loose material is tracked onto paved roads, Mountain Valley contractors would sweep or vacuum to remove from the road. During construction, Mountain Valley would inspect roads periodically and, if damages occur as a direct result of Project-related activities, would repair them as appropriate and in accordance with the applicable permit. Following construction, roads would be restored to their original conditions unless otherwise directed by the landowner, county, or state agency. Therefore, we conclude that construction activities would result in temporary to short-term impacts on transportation infrastructure.

4.9.5 Property Values and Insurance

We received several comments during the scoping period regarding the potential effect of the Project on property values and home insurance. Specific issues mentioned include devaluation of property if encumbered by a pipeline easement; being the responsible party for property taxes within a pipeline easement; paying increased landowner insurance premiums for Project-related effects; the inability to obtain home insurance or charges of higher premiums if the property is encumbered by a pipeline easement; and negative economic effects resulting from changes in land use (e.g., loss of timber production within the permanent right-of-way).

To address these comments, we conducted a review of available literature to assess potential Project impacts. A 1994 paper compared data from nine towns in Connecticut traversed by natural gas pipelines operated by Algonquin and Tennessee Gas Pipeline companies since the 1960s, with a Southwestern pipeline through a planned community near a major city. The

Connecticut study assessed 1,171 home sales between 1986 and 1991. The Southwestern study looked at 2,212 home sales between 1988 and 1991. The results of the studies for both Connecticut and the Southwestern pipeline were essentially the same. No systematic pattern of measureable or significant negative impacts on home sale prices were observed for residences close to a natural gas pipeline (Kinnard et al., 1994). Portland State University evaluated the impact of the South Mist Pipeline Extension (SMPE) in Clackamas and Washington Counties, Oregon on residential sales between 2004 and 2008. Based on sales price data for 10,642 single-family residential properties located within 1 mile of the pipeline, the study found that proximity to the pipeline had no statistically or economically significant impact on residential property values (Fruits, 2008). A 2011 study analyzed sales data from approximately 1,000 residential properties in Arizona to test whether proximity to a natural gas pipeline had an effect on real estate sales prices. The study compared sales prices for properties encumbered by or adjacent to a natural gas transmission pipeline with comparable properties not along a pipeline right-of-way. The study was unable to identify a systematic relationship between proximity to a pipeline and sales price or property values (Diskin et al., 2011). Lastly, Wilde et al. (2014) published a study of the effects the Kern River Pipeline had on property values within the subdivision of Summerlin near Las Vegas, Nevada, based on home sales and data reviewed at the Clark County Assessor's office. Looking at sales between 1991 and 1996 of representative three bedroom single-family houses, the study found that properties closest to the pipeline sold on average for higher prices than properties farther away.

Generally, the value of a tract of land, with or without a dwelling, is dependent on many variables, including the size of the tract, improvements, land use, views, location, and nearby amenities, and the values of adjacent properties. The presence of a pipeline, and the restrictions associated with an easement, may influence a potential buyer's decision whether or not to purchase that property. If a buyer is looking for a specific use, which the presence of the pipeline renders infeasible, then the buyer may decide against purchasing that property in favor of another tract without a pipeline and more suitable to their objectives. This would be similar to other buyer-specific preferences, such as nearby shopping centers, relative seclusion, or access to a high quality school district. Based the studies we reviewed, we conclude that the specific preferences of the buyer would determine if the presence of a natural gas pipeline would or would not significantly reduce property values. Further, for the studies we reviewed, the presence or proximity of a natural gas pipeline did not exert a systemic negative effect on housing resale prices.

Negotiated easement agreements compensate landowners and generally establish terms for addressing damages caused by Project construction and operation. These easement agreements can also include indemnification language, which means that the company, not the landowner, would be responsible for any damages or injuries resulting from pipeline construction and operation. If the applicants cannot reach agreements with landowners, and the Commission authorizes the projects and issues Certificates, the applicants may use the power of eminent domain, granted by the U.S. Congress under Section 7(h) of the NGA, to obtain easements. However, in those cases, a local court would decide on the value of the easements.

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, 2014). As such, we find that homeowners' insurance rates are unlikely to change due to construction and operation of the proposed Project.

We conclude that the Project would not have a significant adverse impact on property values; and would not affect the ability of homeowners to obtain fair market base priced insurance.

4.9.6 Tourism

Tourism opportunities occurring in the Project area include state and local special interest areas discussed in section 4.8, as well as other tourism-dependent businesses including agro- (small farms, seasonal farm stands, pumpkin patches, etc.) and hiking, boating, and other outdoor recreation) activities. We received several comments during scoping expressing concern that construction of the Project would impact tourism, particularly outdoor recreation. Travel-related spending supports local economies, and many people are employed by activities related to tourism (see table 4.9-5).

TABLE 4.9-5

Travel-Related Economic Contributions in the Southgate Project Area

State / County	Travel-Related Expenditures ($ million)	Travel-Related Local Tax Receipts ($ million)	Travel-Related Employment	Percent of Total Employment
Virginia				
Pittsylvania a/	73.3	2.14	660	2.2
North Carolina				
Rockingham b/	70.9	1.7	570	1.4
Alamance b/	180.0	3.1	1,400	1.8
Project Area Total	**324.2**	**6.9**	**2,630**	**1.7**

a/ VATC, 2016
b/ VisitNC, 2016

Scheduled construction of the Project would overlap with the peak tourism season and could impact public access to tourist attractions and accommodations. Construction contractors could increase competition for vacant rental units, hotel/motel rooms, and camping spots that would otherwise be procured by visitors to the Project area. However, as explained above in section 4.9.2, we conclude that available temporary housing is sufficient to accommodate the expected influx of workers and other housing needs.

As discussed in section 4.8.2, the Project is not expected to result in significant impacts on any recreation areas. No significant impacts on hunting, fishing, hiking, and other similar outdoor recreation are anticipated. Any impacts on recreation during construction would be temporary. Overall, impacts on tourism are expected to be minor and limited to the period of construction.

4.9.7 Economy and Tax Revenue

Table 4.9-6 below summarizes the economic characteristics of the counties affected by the Project.

TABLE 4.9-6

Existing Economic Conditions in the Southgate Project Area

Project/Location	Per capita income (dollars) a/	Civilian Workforce b/	Unemployment Rate (percent) b/	Top Three Industries a/
Virginia				
Pittsylvania	22,650	29,542	4.5	Construction, Educational and Health Services, Manufacturing
North Carolina				
Rockingham	21,298	41,106	5.2	Arts and Entertainment, Education and Health Services, Manufacturing
Alamance	23,989	79,767	4.3	Construction, Educational and Health Services, Manufacturing
Project Totals		**150,415**		

a/ U.S. Census Bureau 2017a
b/ BLS 2018

Mountain Valley estimates that the total capital cost of the Project would be about $464 million. About $68 million would be spent directly in Virginia and $113 million in North Carolina. The remaining expenditures would occur outside of the Project area. Mountain Valley estimates that the total construction payroll would be $38.7 million in Virginia and $65.6 million in North Carolina. Based on workforce projections, Mountain Valley estimates that $0.9 million in income tax revenues would be generated by construction payroll in Virginia and $1.5 million in income tax revenues in North Carolina. Mountain Valley also estimates that during the peak of construction, the Project would create about 1,020 direct jobs, and an additional 680 indirect and induced jobs (FTI, 2019). Construction of the Project would also generate an aggregate total of $4.1 million in state and local taxes (income, sales, property, and other taxes) in Virginia and $6.3 million in North Carolina.

Operation of the Project would result in long-term ad valorem property tax benefits for the counties crossed by the Project in Virginia and North Carolina. These property taxes would be paid for the life of the Project. Mountain Valley estimates that it would pay a total of up to $1.2 million in property of ad valorem taxes in Virginia annually and a total of up to $1.7 million in property of ad valorem taxes in North Carolina annually.

During operation of the Project, a total of about six direct and indirect jobs would be supported in Virginia, with average annual salaries of about $79,000. In North Carolina, a total of about six direct and indirect jobs would be supported, with average annual salaries of about $71,000 (FTI, 2019).

Based on available economic data and the expected impacts of the Project, we conclude the Project would result in temporary beneficial impacts on the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables Project-specific materials, room rentals, and sales tax.

4.9.8 Environmental Justice

Executive Order 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.

Consistent with EO 12898, 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."

As discussed in sections 1.1 and 1.4 of this EIS, there have been many opportunities for public involvement during the Commission's environmental review process. The FERC has issued multiple notices regarding the Project that were posted on the Commission public dockets, published in the Federal Register, and sent to our environmental mailing list that included local libraries and newspapers. The FERC also held multiple public scoping meetings in the Project area.

All documents that form the administrative record for these proceedings are available to the public electronically through the internet on the FERC's web page (www.ferc.gov). Anyone, at any time, may comment to the FERC about the Project, either in writing or electronically.

We recognize that not everyone has internet access or is comfortable or adept at filing electronic comments. For this reason, each notice and Project Update brochure was physically mailed to all parties on the environmental mailing list. Further, FERC staff has consistently emphasized in meetings with the public that all comments, whether spoken or delivered in person at meetings, mailed in, or submitted electronically, receive equal weight by FERC staff for consideration in the EIS. In addition, Mountain Valley sent copies of its FERC applications in hard copy and/or digital format to the local libraries in the Project area.

4.9.8.1 Minority and Low-income Populations

According to CEQ environmental justice guidance under NEPA (CEQ, 1997) and EPA's Environmental Justice Interagency Working Group's *Promising Practices for Environmental Justice Methodologies in NEPA Reviews* (EPA, 2016), minorities are those groups that include American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. The guidance also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau. In this EIS, low-income populations are defined as those individuals with reported income below the poverty level.

To determine if the Project would result in disproportionately high and adverse impacts on minority or low-income populations, we used the following criteria to identify potential environmental justice communities:

a. census block groups that have a minority population of more than 50 percent or a minority population that is 10 percentage points higher than their respective county; and

b. census block groups that have a household poverty rate of more than 20 percent or a household poverty rate that is 10 percentage points higher than their respective county.

Table 4.9-7 provides a summary of the minority or low-income percentage of county populations within 1.0 mile of the proposed compressor station and those crossed by the pipeline. The Project pipeline route would cross 33 census block groups, including 1 that is associated with contractor yards only. Of the 33 block groups, 11 contain environmental justice populations as previously defined. Of the 11, two block groups are within 1 mile of the Lambert Compressor Station and contain environmental justice populations.

Impacts on the natural and human environment from construction and operation of Project facilities are identified and discussed throughout this document. Factors that could affect environmental justice communities include air and noise impacts from construction and operation (see section 4.11), visual impacts (section 4.8), and socioeconomic impacts such as traffic, loss of tourism, and crop loss (section 4.9). Potentially adverse environmental effects on surrounding communities associated with the Project, including environmental justice communities, would be minimized and/or mitigated, as discussed in those sections.

As discussed in section 4.11, construction and operation of the compressor station would result in long-term impacts on air quality, but would not be significant. Mountain Valley would use water trucks and road construction entrances to decrease the amount of dust during construction. In addition, potential pollution emissions from the Project, when considered with background concentrations, would be below the National Ambient Air Quality Standards (NAAQS), which are designated to protect public health. Therefore, the Project would not have significant adverse air quality impacts on the low-income or minority populations in the Project area.

As discussed in section 4.11, noise levels resulting from construction would vary over time and would depend upon the number and type of equipment operating, the level of operation, and the distance between sources and receptors. Alternatively, operational noise associated with the new compressor station be persistent; however, Mountain Valley would be required to meet sound level requirements. With Mountain Valley's proposed mitigation measures, the Project would not result in significant noise impacts on local residents and the surrounding communities, including environmental justice populations.

TABLE 4.9-7

Ethnic and Poverty Statistics in the Counties and Census Block Groups Affected by the Southgate Project

	White Alone (percent) a/	African American (percent) a/	Native American/ Alaska Native (percent) a/	Asian (percent) a/	Native Hawaiian & Other Pacific Islander (percent) a/	Some Other Race (percent) a/	Two or more races (percent) a/	Hispanic or Latino (percent) a/	Total Minority Populations (percent) a/	Households in Poverty (percent) b/
Virginia	**62.6**	**18.8**	**0.2**	**6.2**	**0.1**	**0.2**	**2.9**	**9.0**	**37.4**	**NA**
Pittsylvania County	**74.2**	**21.1**	**0.1**	**0.4**	**0.0**	**0.0**	**1.8**	**2.5**	**25.8**	**14.8**
Block Group 1, Census Tract 105 d/	77.8	18.1	0.0	0.9	0.0	0.0	0.0	3.1	22.2	**27.4**
Block Group 3, Census Tract 105	49.8	45.2	0.0	1.3	0.0	0.0	2.4	1.2	**50.2**	7.1
Block Group 1, Census Tract 107 e/	53.6	37.9	0.0	0.0	0.0	0.0	0.8	7.8	**46.4**	15.0
Block Group 2, Census Tract 109	86.4	9.0	0.0	0.0	0.0	0.0	1.8	2.8	13.6	9.8
Block Group 1, Census Tract 110.02	83.4	15.2	0.1	0.3	0.0	0.0	0.8	0.3	16.6	9.5
Block Group 2, Census Tract 110.02	82.3	11.8	0.0	0.0	0.8	0.0	5.1	0.0	17.7	**26.6**
Block Group 2, Census Tract 110.01	92.7	5.9	0.0	0.0	0.0	0.0	1.4	0.0	7.3	10.1

TABLE 4.9-7

Ethnic and Poverty Statistics in the Counties and Census Block Groups Affected by the Southgate Project

	White Alone (percent) a/	African American (percent) a/	Native American/ Alaska Native (percent) a/	Asian (percent) a/	Native Hawaiian & Other Pacific Islander (percent) a/	Some Other Race (percent) a/	Two or more races (percent) a/	Hispanic or Latino (percent) a/	Total Minority Populations (percent) a/	Households in Poverty (percent) b/
Block Group 3, Census Tract 110.01	86.2	13.4	0.0	0.0	0.0	0.0	0.4	0.0	13.8	15.2
Block Group 1, Census Tract 111	80.4	11.9	0.0	0.0	0.0	0.0	0.0	7.7	19.6	19.5
Block Group 2, Census Tract 111	46.4	41.5	0.0	0.0	0.0	0.0	0.0	12.1	**53.6**	10.7
Block Group 3, Census Tract 114	79.7	20.3	0.0	0.0	0.0	0.0	0.0	0.0	20.3	14.8
North Carolina	**63.6**	**21.2**	**1.1**	**2.7**	**0.1**	**0.2**	**2.1**	**9.1**	**36.4**	**NA**
Rockingham County	***72.6***	***18.5***	***0.5***	***0.5***	***0.1***	***0.2***	***1.7***	***6.0***	***27.4***	***17.5***
Block Group 1, Census Tract 402	88.6	7.2	0.0	0.7	0.0	0.0	1.4	1.4	11.4	5.3
Block Group 2, Census Tract 402 c/	40.1	22.2	0.9	0.0	0.0	35.4	0.7	36.1	**59.9**	**22.3**
Block Group 1, Census Tract 401.01	69.9	29.8	0.0	0.0	0.0	0.0	0.0	0.3	30.1	**24.9**

TABLE 4.9-7

Ethnic and Poverty Statistics in the Counties and Census Block Groups Affected by the Southgate Project

	White Alone (percent) a/	African American (percent) a/	Native American/ Alaska Native (percent) a/	Asian (percent) a/	Native Hawaiian & Other Pacific Islander (percent) a/	Some Other Race (percent) a/	Two or more races (percent) a/	Hispanic or Latino (percent) a/	Total Minority Populations (percent) a/	Households in Poverty (percent) b/
Block Group 2, Census Tract 401.01	72.6	24.5	2.3	0.0	0.0	0.0	0.7	0.0	27.4	12.8
Block Group 3, Census Tract 401.01	61.3	21.8	0.0	0.0	0.0	0.0	1.0	15.8	**38.7**	5.9
Block Group 2, Census Tract 401.02	52.4	43.2	0.0	0.0	0.0	0.0	0.0	4.4	**47.6**	**23.9**
Block Group 3, Census Tract 401.02	80.8	8.6	0.0	0.0	0.0	0.0	10.5	0.0	19.2	18.5
Block Group 1, Census Tract 411	77.2	22.8	0.0	0.0	0.0	0.0	0.0	0.0	22.8	0.0
Block Group 1, Census Tract 413	82.8	9.9	0.0	0.8	0.0	0.0	3.9	2.6	17.2	**20.2**
Block Group 2, Census Tract 413	67.4	27.8	4.2	0.0	0.0	0.0	0.0	0.6	32.0	14.4
Block Group 4, Census Tract 413	57.0	27.9	0.0	0.0	0.0	0.0	4.0	11.1	32.8	**24.6**

TABLE 4.9-7

Ethnic and Poverty Statistics in the Counties and Census Block Groups Affected by the Southgate Project

	White Alone (percent) a/	African American (percent) a/	Native American/ Alaska Native (percent) a/	Asian (percent) a/	Native Hawaiian & Other Pacific Islander (percent) a/	Some Other Race (percent) a/	Two or more races (percent) a/	Hispanic or Latino (percent) a/	Total Minority Populations (percent) a/	Households in Poverty (percent) b/
Block Group 2, Census Tract 414	35.5	40.1	0	0.0	0.0	0.0	0.0	24.4	**64.5**	**32.8**
Alamance County	***65.0***	***18.9***	***0.3***	***1.5***	***0.0***	***0.1***	***1.9***	**12.3**	**35.0**	***16.3***
Block Group 1, Census Tract 215	82.0	10.9	0.0	0.0	0.0	0.0	0.0	7.1	18.0	5.5
Block Group 2, Census Tract 215	82.3	11.0	0.0	0.0	0.0	0.0	0.0	6.6	17.7	1.4
Block Group 3, Census Tract 215	78.4	2.0	0.0	0.0	0.0	0.0	0.0	19.6	21.6	10.3
Block Group 4, Census Tract 215	88.3	7.0	0.0	0.0	0.0	0.0	1.2	3.6	11.7	18.3
Block Group 1, Census Tract 214	90.3	1.1	0.0	0.5	0.0	0.0	3.7	4.5	9.7	19.3
Block Group 5, Census Tract 213	63.2	30.2	0.1	0.0	0.0	0.6	1.1	4.8	35.9	19.5
Block Group 2, Census Tract 212.01	62.6	20.2	0.0	0.0	0.2	0.0	3.1	13.9	37.4	16.7

TABLE 4.9-7

Ethnic and Poverty Statistics in the Counties and Census Block Groups Affected by the Southgate Project

	White Alone (percent) a/	**African American (percent) a/**	**Native American/ Alaska Native (percent) a/**	**Asian (percent) a/**	**Native Hawaiian & Other Pacific Islander (percent) a/**	**Some Other Race (percent) a/**	**Two or more races (percent) a/**	**Hispanic or Latino (percent) a/**	**Total Minority Populations (percent) a/**	**Households in Poverty (percent) b/**
Block Group 3, Census Tract 212.01	84.1	8.2	0.0	0.0	0.0	0.0	0.5	7.2	15.9	11.0
Block Group 1, Census Tract 220.01	75.3	18.3	0.0	2.0	0.0	0.0	0.5	3.9	24.7	5.5

Shading denotes exceedances.

a/ U.S. Census Bureau, 2017b

b/ U.S. Census Bureau, 2017c

c/ Contractor Yard is the only Project facility within the block group

d/ Compressor Station site is within the block group.

e/ Compressor Station site is within 1 mile of the block group

Affects to visual resources (see section 4.8) would be Project wide and would not be concentrated in any single area or community. After construction, all disturbed areas associated with pipeline construction would be restored and areas outside of the permanent right-of-way would be returned to pre-construction conditions. In addition, given that views of the compressor station would be limited and there are no direct views of the site from residences, construction of the compressor station is not expected to result in any significant permanent impacts on visual resources. Therefore, the Project would not have significant visual impacts on environmental justice populations in the Project area.

Socioeconomic impacts that could affect environmental justice communities include traffic, loss of income due to crop loss and decreases in tourism and associated income. Area residents may be affected by traffic delays during construction of the Project. However, mitigation measures would be implemented to alleviate any potential road congestion during construction through the establishment of temporary travel lanes, the use of steel plates, and the use of flagmen and signs, as necessary, to ensure safety of local traffic. After pipeline installation, all roads crossed would be returned to their pre-construction condition and use. Mountain Valley would compensate landowners for any crop loss that occurs during construction of the Project. Mountain Valley would also monitor agricultural areas post-construction to ensure the areas within the right-of-way return to pre-construction yields. Additionally, no significant impacts on tourism are anticipated from the Project. With Mountain Valley's proposed mitigation measures, the Project would not result in significant impacts on local residents and the surrounding communities, including environmental justice populations.

Potentially adverse environmental impacts on surrounding communities, including environmental justice populations, would be minimized and/or mitigated, as applicable, below a level of significance. Overall, although low-income and minority populations exist within the Project area, based on our environmental analysis, we conclude that the Project would not have a disproportionately high and adverse environmental or human health impact on minority or low-income populations.

4.9.9 Socioeconomics Conclusions

Impacts on socioeconomic factors associated with construction and operation of the proposed Project are expected to be minor. The limited workforce and short duration of construction would result in a temporary, but minor impact on population, local unemployment levels, and housing available. Since there is plenty of available housing within the Project area, we do not anticipate that the Project would displace any tourists during the construction period. Additionally, no large tourist areas (including state or local parks, fishing areas, piers, etc.) would be crossed or affected by the Project. The communities in the Project area have adequate infrastructure to meet the potential needs of non-local workers who relocate temporarily. Community services would be supported by additional tax revenues generated by the Project. There may be a minor increase in the use of community/public services due to both construction activities (traffic control or medical needs) as well as a result of the increase in general population due to the influx of non-local workers to the area. The increase in traffic due to transportation of equipment and personnel would be mitigation using the measures outlined in Mountain Valley's *Traffic Mitigation Plan*. The Project would not have a significant adverse impact on property values; and would not affect the ability of homeowners to obtain fair market base priced insurance.

There may be a potential benefit to the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables Project-specific materials, room rentals, and sales tax. However, these benefits would generally be temporary and minor. Overall, socioeconomic impacts from the Project on the local communities would be minor.

Although low-income and minority populations exist within the Project area, based on our environmental analysis, the Project would not have a disproportionately high and adverse environmental or human health impact on minority or low-income populations.

4.10 CULTURAL RESOURCES[22]

The NHPA is the cornerstone of the federal government's historic preservation program. Section 101(d)(6) of the NHPA states that properties of traditional religious and cultural importance to Indian tribes[23] may be determined eligible for the NRHP. In carrying out our responsibilities under Section 106 of the NHPA, on behalf of all the federal cooperating agencies, and as the lead federal agency, the FERC conducted government-to-government consultations with Indian tribes that may attach religious and cultural importance to properties in the APE, in accordance with the implementing regulations at 36 Code of Federal Regulations (CFR) 800.2(c)(2)(ii). Consultations with Indian tribes are detailed below.

Section 106 of the NHPA requires that the FERC take into account the effect of its undertakings[24] (including authorizations under Sections 3 and 7 of the NGA) on historic properties,[25] and afford the ACHP an opportunity to comment. Mountain Valley, as a non-federal applicant, is assisting the FERC staff in meeting our obligations under Section 106 by providing data, analyses, and recommendations in accordance with 36 CFR 800.2(a)(3) and the FERC's regulations at 18 CFR 380.12(f). Information about cultural resources in the APE was gathered for Mountain Valley by its consultant, TRC Solutions, Inc. (TRC). The FERC remains responsible for all findings and determinations under the NHPA. As the lead federal agency for the Project, the FERC will address compliance with the NHPA on behalf of all the federal cooperating agencies in this EIS.[26]

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22 Cultural resources are locations of human activity, occupation, or use. According to the FERC's Office of Energy Projects "Guidelines for Reporting on Cultural Resources Investigations for National Gas Projects," cultural resources include any prehistoric or historic archaeological site, district, object, cultural feature, building or structure, cultural landscape, or traditional cultural property. Although "cultural resources" are not defined in 36 CFR 800, it is a "term-of-art" in the field of historic preservation and archaeological research. Indian tribes believe that cultural resources could include natural resources, such as plants and animals of traditional importance to tribes, and topographic features and viewsheds that may be sacred.

23 Indian tribes are defined in 36 CFR 800.16(m) as: "an Indian tribe, band, nation, or other organized group or community, including a Native village, Regional Corporation, or Village Corporation, as those terms are defined in Section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their special status as Indians."

24 "Undertaking means a project activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency," as defined in 36 CFR 800.16(y).

25 Historic properties include any prehistoric or historic district, site, building, structure, or object, and properties of traditional religious or cultural importance to Indian tribes, listed on or eligible for listing on the NRHP, as defined in 36 CFR 800.16(l).

26 Pursuant to 36 CFR 800.2(a)(2), the Energy Policy Act (EPAct), and the May 2002 Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction With the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certificated by the Federal Energy Regulatory Commission, signed by the FERC, Advisory Council on Historic Preservation, Council on Environmental Quality, Environmental Protection Agency, Department of the Army, Department of Agriculture, Department of Commerce, Department of Energy, Department of the Interior, and Department of Transportation.

The regulations for implementing Section 106 of the NHPA, at 36 CFR 800.9, encourages the integration of the 106 compliance process with the NEPA process; and we have done that in this section of the draft EIS below. This section is broken into several subsections that mirrors the Section 106 compliance process. This process includes consultations; identification of historic properties; assessment of effects; and resolution of adverse effects, if necessary. Then we discuss the *Plan for Unanticipated Discoveries of Historic Properties and Human Remains* (Unanticipated Discovery Plans [UDP]) produced by Mountain Valley for this Project,[27] and their reviews by consulting parties. Lastly, we reach conclusions about the status of our compliance with the NHPA.

4.10.1 Consultations

In compliance with Section 106 and its implementing regulations, at 36 CFR 800, the FERC, on behalf of all of the federal cooperating agencies, consulted with other federal agencies; the SHPOs of Virginia and North Carolina;[28] interested Indian tribes; Certified Local Governments (CLG), and local historical societies; and other consulting parties, prior to making our determinations of NRHP eligibility and Project effects for all cultural resources identified in the APE. We also consulted with the SHPOs, interested Indian tribes, and other consulting parties to determine the resolution of adverse effects on historic properties that cannot be avoided. Those consultations are summarized below.

The FERC sent copies of our August 9, 2018, NOI for the Project to a wide range of stakeholders, including other federal agencies such as the ACHP, COE, EPA, DOI Bureau of Indian Affairs (BIA), and NPS; state and local government agencies, such as the SHPOs for Virginia and North Carolina; affected landowners; regional environmental groups and non-governmental organizations; and Indian tribes that may have an interest in the Project area. The NOI contained a paragraph about compliance with Section 106 of the NHPA, which stated that we use the notice to initiate consultations with the SHPOs as well as to solicit their views and those of other government agencies, interested Indian tribes, and the public on the Project's potential effects on historic properties. Comments from the SHPOs, interested Indian tribes, other government agencies, and the public, in response to the NOI, are summarized below.

4.10.1.1 Consultations with the State Historic Preservation Offices

FERC Consultations

Neither the Virginia nor North Carolina SHPOs commented directly to the FERC in response to our August 9, 2018 NOI. FERC staff had a telephone conversation with representatives of the Virginia Department of Historic Resources (VADHR) about the Project on August 7, 2018.

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27 Mountain Valley's *Plan for Unanticipated Discoveries of Historic Properties and Human Remains* (UDP) was included as appendix 4-C to Resource Report 4 in its November 6, 2018 application. The UDP can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

28 The Virginia SHPO is represented by the Department of Historic Resources (VADHR); while the North Carolina SHPO is housed within the Department of Natural and Cultural Resources (NCDNCR) which also includes the North Carolina Office of the State Archaeologist (OAS).

Communication Between Mountain Valley and the SHPOs

Communications between Mountain Valley and the SHPOs are listed in table 4.10-1 (current as of May 30, 2019).

TABLE 4.10-1

Communications between Mountain Valley and the Virginia and North Carolina SHPOs for the Southgate Project

Date	Type/Author (Affiliation)	Recipient (Affiliation)	Subject
Virginia Department of Historic Resources			
4/27/2018	Letter – Alex Miller (MV) **a/**	Roger Kirchen (VADHR)	Project introduction package and request for comment
5/17/2018	Presentation – Alex Miller (MV)	VADHR staff	PowerPoint presentation on Project
6/4/2018	Letter – Alex Miller (MV)	Roger Kirchen (VADHR)	Historic structures work plan, shapefile submittal
7/2/1018	Email – Alex Miller (MV)	Roger Kirchen (VADHR)	Work plans follow up
8/3/2018	Email – Paul Web (TRC)	Roger Kirchen (VADHR)	Plans to file Resource Report (RR) 4 including Unanticipated Discovery Plan (UDP); invitation to site visits
9/14/2018	Roger Kirchen (VADHR)	Alex Miller (MV)	RR 4 review, acceptance of UDP
11/6/2018	Letter – Tracy Millis (TRC)	Roger Kirchen (VADHR)	Submittal of first draft Phase I archaeological survey report and first draft historic architectural survey report
2/13/2019	Letter - Roger Kirchen (VADHR)	Paul Web (TRC)	VA SHPO comments on first draft Phase I archaeological survey report and first draft historic architectural survey report
2/22/2019	Letter – Tracy Millis (TRC)	Roger Kirchen (VADHR)	Submittal of final first Phase I archaeological survey report
2/22/2019	Letter - Tracy Millis (TRC)	Roger Kirchen (VADHR)	Submittal of first draft report on Phase II testing at archaeological sites 44PY271, PY445, and PY451
3/25/2019	Letter – Tracy Millis (TRC)	Roger Kirchen (VADHR)	Submittal of second draft report on Phase II testing at archaeological sites 44PY375, PY449, and PY455
5/3/19	Email – Paul Webb (TRC)	Rodger Kirchen (VADHR)	Attached PowerPoint slides of 4/25/19 visit to site 31RK217
5/10/19	Letter - - Roger Kirchen (VADHR)	Paul Web (TRC)	VA SHPO comments on first draft Phase II testing report
5/16/19	Letter – Roger Kirchen (VADHR)	Paul Webb (TRC)	VA SHPO comments on report of Supplemental Phase II Testing at sites 44PY375, 44PY449, and 44PY55

TABLE 4.10-1

Communications between Mountain Valley and the Virginia and North Carolina SHPOs for the Southgate Project

Date	Type/Author (Affiliation)	Recipient (Affiliation)	Subject
North Carolina Department of Natural and Cultural Resources			
4/27/2018	Letter – Alex Miller (MV)	Renee Gledhill-Earley (NCDNCR)	Project introduction package and request for comment
5/10/2018	Presentation – Alex Miller (MV)	NCDNRCR staff	PowerPoint presentation on Project
5/10/2018	Email – Susan Myers (NCDNRCR)	Paul Webb (TRC)	List of historical museums
5/17/2018	Email – Susan Myers (NCDNRCR)	Paul Webb (TRC)	Information on other cultural resources contacts
5/17/2018	Email – Alex Miller (MV)	Renee Gledhill-Earley (NCDNCR)	Project meeting
5/21/2018	Letter – Renee Gledhill-Earley (NCDNRCR)	Alex Miller (MV)	Comments on Project introduction package
5/21/2018	Letter – Ramona Bartos (NCDNCR)	Alex Miller (MV)	Survey recommendation
5/22/2018	Email – Susan Meyers (NCDNCR)	Paul Webb (TRC)	Information on other cultural resources contacts; Alamance and Rockingham listings
5/22/2018	Email – Renee Gledhill-Earley (NCDNCR)	Alex Miller (MV)	Request for map and consultation with federally-recognized tribes, state-recognized tribes, and NC Commission on Indian Affairs
5/29/2018	Email – Renee Gledhill-Earley (NCDNRCR)	Alex Miller (MV)	Request for map; no additional meeting needed
5/29/2018	Email – Alex Miller (MV)	Renee Gledhill-Earley (NCDNCR)	Approval to submit shapefiles
6/4/2018	Email – Alex Miller (MV)	Renee Gledhill-Earley (NCDNCR)	Work plans and shapefile submittal
6/12/2018	Telephone call – Paul Webb (TRC)	Susan Myers (NCDNRCR)	Project update; transition to Rosie Blewitt-Golsch
7/3/2018	Email – Paul Webb (TRC)	Rosie Blewitt-Golsch (NCDNCR)	Site number request
7/3/2018	Email – Alex Miller (MV)	NCDNCR	Request for 50 site numbers
7/5/2018	Letter – Renee Gledhill-Earley (NCDNCR)	Alex Miller (MV)	Comments on work plans, shape file; two historic properties may be affected (31AM867 and AM1516)
7/6/2018	Email – Rosie Blewitt-Golsch (NCDNRCR)	Paul Webb (TRC)	Site numbers

TABLE 4.10-1

Communications between Mountain Valley and the Virginia and North Carolina SHPOs for the Southgate Project

Date	Type/Author (Affiliation)	Recipient (Affiliation)	Subject
7/24/2018	Telephone call – Paul Webb (TRC)	John Mintz (NCDNCR)	Project website inquiry, site visit discussion
7/24/2018	Email – Paul Webb (TRC)	John Mintz (NCDNCR)	Scheduling site visit
7/24/2018	Email – John Mintz (NCDNCR)	Paul Webb (TRC)	Scheduling site visit
7/27/2018	Email – Lindsay Ferrante (NCDNCR)	Paul Webb (TRC)	Scheduling site visit
7/27/2018	Email – Paul Webb (TRC)	Lindsay Ferrante (NCDNCR)	Scheduling site visit
7/27/2018	Email – Lindsay Ferrante (NCDNCR)	Paul Webb (TRC)	Scheduling site visit
8/3/2018	Email – Paul Webb (TRC)	Renee Gledhill-Earley, John Mintz, Lindsay Ferrante, Rose Blewitt-Golsch (NCDNCR)	Site visits; upcoming RR 4 and UDP submittal
8/13/2018	Telephone call – Katie Harville (NCDNRCR)	Alex Miller (MV)	Landowner contact concerning Kerr Scott Farm
8/13/2018	Email – Paul Webb (TRC)	Renee Gledhill-Earley (NCDNCR)	Public version of RR4, privileged Figure 4-5.1
8/13/2018	ftp – Paul Webb (TRC)	Renee Gledhill-Earley (NCDNCR)	Sending privileged version of SHPO correspondence
8/13/2018	Email – Paul Webb (TRC)	Renee Gledhill-Earley (NCDNCR)	Revision of Archaeological Survey-Testing-Deep Testing Plan addressing 7/5/18 NCDNCR comments
8/21/2018	Meeting – Alex Miller (MV), Paul Webb, Tracy Milliis (TRC)	Lindsay Ferrante, Rosie Blewitt-Golsch, Kim Urban, Katie Harville (NCDNCR)	Field visit
9/6/18	Letter - Ramona Bartos (NCDNCR)	Paul Webb (TRC)	Acknowledging receipt of draft survey reports, amended work plans for survey and testing, and approval of the UDP
9/6/2018	Email – Renee Gledhill-Earley (NCDNCR)	Alex Miller (MV)	Comments on revised work plan, RR4, and UDP
9/11/2018	Email – Paul Webb (TRC)	Rosie Blewitt-Golsch (NCDNRCR)	Site numbers requested
9/12/2018	Email – Paul Webb (TRC)	Rosie Blewitt-Golsch (NCDNCR)	Requested information on 31AM431
9/12/2018	Email – Rosie Blewitt-Golsch (NCDNCR)	Email – Paul Webb (TRC)	Site numbers, AM431 site form

TABLE 4.10-1

Communications between Mountain Valley and the Virginia and North Carolina SHPOs for the Southgate Project

Date	Type/Author (Affiliation)	Recipient (Affiliation)	Subject
9/26/2018	Email – Tracy Millis (TRC)	Rosie Blewitt-Golsch (NCDNCR)	Site numbers request
9/26/2018	Email – Rosie Blewitt-Golsch (NCDNCR)	Email – Tracy Millis (TRC)	Site numbers
10/2/2018	Email – Paul Webb (TRC)	Lindsay Ferrante (NCDNCR)	Setting up October meeting
10/2/2018	Email – Lindsay Ferrante (NCDNCR)	Paul Webb (TRC)	Setting up October meeting
11/6/2018	Letter - Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Submittal of draft Phase I archaeological survey reports and draft historic architecture survey reports for NC
12/20/2018	Letter - Renee Gledhill-Earley (NCDNCR)	Tracy Millis (TRC)	NC SHPO comments on draft Phase I archaeological survey report and draft historic architecture survey report for NC
1/14/2019	Telephone call - John Mintz (NCDNCR)	Paul Webb (TRC)	Setting up a site visit
1/25/2019	Site Visit Meeting – Paul Webb, Jeff Johnson, Missy Emery, John Haefner, Chandra Wilson (TRC), Rich Estabrook (NextEra)	David Cranfored, Cassandra Pardo (NCDNCR)	Visit to archaeological field work in Alamance County, NC
3/13/2019	Letter – Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Conveyed copy of draft Phase II testing report for two sites in NC
3/28/2019	Letter – Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Conveyed copy of draft Phase I archaeological survey addendum report for NC
4/15/19	Letter – Ramona Bartos (NCDNCR)	Tracy Millis (TRC)	NC SHPO comments on first draft Phase II testing report
4/24/19	Letter – Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Conveyed copy of draft Phase II testing report for sites 31RK222, RK259, and RK261
4/29/19	Letter – Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Conveyed copy of final Historic Architectural Survey report
5/3/19	Email – Paul Webb (TRC)	John Mintz and Rosemarie Blewitt (NCDNCR)	Attached PowerPoint slides of 4/25/19 visit to site 31RK217
5/7/19	Letter – Ramona Bartos (NCDNCR)	Tracy Millis (TRC)	NC SHPO comments on first draft Phase I Addendum I report

TABLE 4.10-1

Communications between Mountain Valley and the Virginia and North Carolina SHPOs for the Southgate Project

Date	Type/Author (Affiliation)	Recipient (Affiliation)	Subject
5/13/19	Letter – Tracy Millis (TRC)	Renee Gledhill-Earley (NCDNCR)	Conveyed copy of draft Addendum Report 1 of the Historic Architectural Survey
5/20/18	Email –Paul Webb (TRC)	John Mintz and Rosemarie Blewitt (NCDNCR)	Work plan for sites 31AM442 and AM447
5/24/19	Letter – Ramona Bartos (NCDNCR)	Tracy Millis (TRC)	NC SHPO comments on Phase II archaeological testing report

a/ MV = Mountain Valley

Mountain Valley presented its Project information packages to the Virginia and North Carolina SHPOs on April 27, 2018. On May 17, 2018, Mountain Valley met with VADHR staff, and on May 10, 2018, it met with staff of the North Carolina Department of Natural and Cultural Resources (NCDNCR). On June 4, 2018, Mountain Valley provided both the Virginia and North Carolina SHPOs with GIS shape files for its proposed facilities, and protocols for the identification and assessment of historic architectural sites. The North Carolina SHPO accepted the protocols on July 6, 2018, but requested additional data about protecting graveyards. Mountain Valley provided the NCDNCR with revised protocols for archaeological survey and testing in North Carolina on August 13, 2018. Mountain Valley's protocols for recording and assessing archaeological sites and a deep testing plan for Virginia, was submitted to the VADHR on July 2, 2018. On August 13, 2018, Mountain Valley submitted copies of a draft Resource Report (RR) 4 (Cultural Resources) and UDP to the Virginia and North Carolina SHPOs. The Virginia SHPO commented on draft RR 4 in a letter to Mountain Valley dated September 14, 2018. The North Carolina SHPO commented on draft RR 4 in a letter to Mountain Valley's cultural resources consultant, TRC, dated September 6, 2018. NCDNCR staff visited the Project area on August 21, 2018; conducted a visit of archaeological field work in Alamance County, North Carolina on January 25, 2019; and visited site 31RK217 on April 24, 2019.

On November 6, 2018, TRC, on behalf of Mountain Valley, provided the Virginia and North Carolina SHPOs with copies of its draft Phase I archaeological survey reports and draft historic architectural survey reports. The North Carolina SHPO commented on those first draft reports in letters dated December 20, 2018. The Virginia SHPO commented on the first draft survey reports on February 13, 2019.

On February 22 and March 25, 2019, TRC submitted to the VADHR copies of draft Phase II testing reports for Virginia. The VADHR provided comments on those reports in letters to TRC dated May 10 and 16, 2019.

On March 13, 2019, TRC submitted to the NCDNCR a copy of its draft Phase II testing report for two sites in North Carolina. The NCDNCR provided comments on that report to TRC in a letter dated April 15, 2019. On March 28, 2019, TRC submitted to the NCDNCR a copy of its draft Phase I archaeological survey addendum report for North Carolina. The NCDNCR commented on that addendum report in a May 7, 2019 letter to TRC. On May 13, 2019, TRC provided the NCDNRC with its first draft addendum I report of its historic architectural survey in North Carolina (Karpynec, 2019).

4.10.1.2 Consultations with Indian Tribes and Other Native Americans

The unique and distinctive political relationship between the U.S. government and Indian tribes is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiates tribes from other entities that deal with, or are affected by, the federal government. This relationship has given rise to a special federal trust responsibility, involving the legal obligations of the U.S. government toward Indian tribes, and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights.

The FERC acknowledges that it has trust responsibilities to Indian tribes, and so, on July 23, 2003, it issued a "Policy Statement on Consultations with Indian Tribes in Commission Proceedings" in Order 635. That policy statement included the following key objectives:

- The Commission will endeavor to work with Indian tribes on a government-to-government basis, and will seek to address the effects of proposed projects on tribal rights and resources though consultations; and
- The Commission will ensure that Tribal resources and interests are considered whenever the Commission's actions or decisions have the potential to adversely affect Indian tribes or Indian trust resources.

The FERC contacted Indian tribes that may attach religious or cultural significance to sites in the region or may be interested in potential Project impacts on cultural resources. We identified Indian tribes that historically used or occupied the Project area through basic ethno-historical sources such as the Handbook of North American Indians (Trigger, 1978; Fogelson, 2004); communications with the SHPOs and other state agencies such as the North Carolina Commission on Indian Affairs; information provided by Mountain Valley and its cultural resources consultants; and scoping responses to our NOI, including letters from interested Indian tribes.

In a letter to the FERC, dated September 10, 2018, Appalachian Mountain Advocates requested that we consult with the state-recognized Sappony Tribe of North Carolina, and also independently determine if the Project would affect the ancestral lands of any other tribes. As discussed below, Mountain Valley did communicate with the Sappony Tribe. A private citizen of Virginia, Ann Rodgers, suggested that we consult with the Cheyenne River Sioux Tribe and the Rosebud Sioux Tribe of South Dakota about the Project. However, when Mountain Valley reached out to the Cheyenne River Sioux Tribe and the Rosebud Sioux Tribe, these two tribes did not respond to correspondence.

FERC Consultations with Indian Tribes and Other Native Americans

Government-to-government consultations between the FERC and Indian tribes were initiated for this Project when we issued our NOI on August 9, 2018. We sent our NOI to 33 federally-recognized Indian tribes, and 3 other Native American organizations or state-recognized tribes in Virginia and 7 state-recognized tribes in North Carolina. On October 16, 2018, we sent out individual letters to 25 Indian tribes. These consultations are listed in table 4.10-2.

TABLE 4.10-2

Indian Tribes and Native American Organizations Contacted by the FERC for the Southgate Project

Indian Tribes or Native American Organizations (contacts)	Sent the FERC's 8/9/18 NOI	Sent Letter from FERC on 10/16/18	Responses to FERC Contacts
Federally-Recognized Tribes			
Absentee Shawnee Tribe of Oklahoma (c/o Edwina Butler-Wolfe, Governor; and Erin Thompson, THPO a/)	Yes	Yes	11/1/18 letter to FERC from Devon Frazier THPO conveyed a finding of "no adverse effects" and stated that the Tribe has no objections to the Project. The Tribe remains interested and should be contacted in the event of a discovery during construction
Catawba Indian Nation of South Carolina (c/o William Harris, Chief; and Wenonah Haire, THPO)	Yes	Yes	None filed to date
Cayuga Nation of New York c/o Clint Halftown, Representative	Yes	Yes	None filed to date
Cherokee Nation of Oklahoma (c/o Bill John Baker, Chief; and Elizabeth Toombs, THPO)	Yes	Yes	1/8/19 email to FERC staff from Elizabeth Toombs THPO stating that Pittsylvania County, VA is outside the AOI for the Cherokee Nation of Oklahoma
Chickahominy Indian Tribe of Virginia (c/o Stephen Adkins, Chief)	Yes	No	None filed to date
Chickasaw Nation of Oklahoma c/o Bill Anoatubby, Governor	Yes	No	9/7/18 letter to FERC from Lisa John of Tribal Culture and Humanities Department stated that Virginia and North Carolina are outside of the homeland for the Chickasaw Nation

TABLE 4.10-2

Indian Tribes and Native American Organizations Contacted by the FERC for the Southgate Project

Indian Tribes or Native American Organizations (contacts)	Sent the FERC's 8/9/18 NOI	Sent Letter from FERC on 10/16/18	Responses to FERC Contacts
Choctaw Nation of Oklahoma (c/o Gary Batton, Chief)	Yes	Yes	9/7/18 letter to FERC stated that both Virginia and North Carolina are outside of the Tribe's homeland area. 1/24/19 letter to FERC from Lindsey Bilyeu, Senior Compliance Review Officer, stated that the Project area is outside the area of historic interest for the Choctaw Nation of Oklahoma
Delaware Nation of Oklahoma (c/o Deborah Dotson, President; and Darren Hill, Cultural Preservation)	Yes	Yes	None filed to date
Delaware Tribe of Oklahoma (c/o Chester Brooks, Chief; and Susan Bachor, Historic Preservation)	Yes	Yes	None filed to date
Eastern Band of Cherokee Indians in North Carolina (c/o Richard Sneed, Chief; and Russell Townsend, THPO)	Yes	Yes	None filed to date
Eastern Division of Chickahominy Indian in Virginia (c/o Gerald Stewart)	Yes	Yes	None filed to date
Eastern Shawnee Tribe of Oklahoma (c/o Glenna Wallace, Chief; and Brett Barnes, THPO)	Yes	Yes	None filed to date
Jena Band of Choctaw Indians in Louisiana (c/o Cheryl Smith, Chief; and Alina Shively, THPO)	Yes	Yes	None filed to date
Mattaponi Tribe in Virginia (c/o Mark Custalow, Chief)	Yes	No	None filed to date
Mississippi Band of Choctaw Indians (c/o Phyliss Anderson, Chief)	Yes	Yes	None filed to date

TABLE 4.10-2

Indian Tribes and Native American Organizations Contacted by the FERC for the Southgate Project

Indian Tribes or Native American Organizations (contacts)	Sent the FERC's 8/9/18 NOI	Sent Letter from FERC on 10/16/18	Responses to FERC Contacts
Monacan Indian Nation in Virginia (c/o Dean Branham, Chief)	Yes	Yes	8/3/18 letter to FERC stated that Project would cross Tribe's ancestral lands and may affect properties of cultural significance to the Tribe. Requested meeting with FERC staff 11/16/18 letter to FERC requested Tribal attendance at all planning meetings, and requested copies of all cultural resources investigation reports for Tribal review. 12/31/18 motion to intervene 2/20/19 letter to FERC reiterating previous requests 7/1/19 letter to FERC commenting on cultural resources reports
Muscogee (Creek) Nation of Oklahoma (c/o Raelynn Butler, Preservation Office)	Yes	Yes	None filed to date
Nansemond Indian Tribe in Virginia (c/o Lee Lockamy, Chief)	Yes	Yes	12/9/18 letter to FERC from Chief Samuel Bass requested meeting with FERC staff
Oneida Indian Nation of New York (c/o Raymond Halbritter, Representative; and Jessie Bergevin, Historian)	Yes	Yes	None filed to date
Oneida Nation of Wisconsin (c/o Tehassi Hill Chair; and Corina Williams, THPO)	Yes	Yes	None filed to date
Onondaga Nation of New York (c/o Sidney Hill, Chief; and Tony Gonyea, Faithkeeper)	Yes	Yes	None filed to date
Ottawa Tribe of Oklahoma (c/o Ethel Cook, Chief)	Yes	No	None filed to date
Pamunkey Indian Tribe in Virginia (c/o Robert Gray, Chief)	Yes	Yes	None filed to date

TABLE 4.10-2

Indian Tribes and Native American Organizations Contacted by the FERC for the Southgate Project

Indian Tribes or Native American Organizations (contacts)	Sent the FERC's 8/9/18 NOI	Sent Letter from FERC on 10/16/18	Responses to FERC Contacts
Poarch Band of Creek Indians in Alabama (c/o Stephanie Bryan, Chair; and Carolyn White, THPO)	Yes	Yes	None filed to date
Rappahannock Tribe in Virginia (c/o Ann Richardson, Chief	Yes	Yes	None filed to date
Saint Regis Mohawk Tribe of New York (Beverly Cook, Chief; and Arnold Printup, THPO)	Yes	Yes	None filed to date
Seneca Nation of New York (c/o Todd Gates, President; and Morris Abrams, THPO)	Yes	Yes	None filed to date
Seneca-Cayuga Nation of Oklahoma (c/o William Fisher, Chief; and William Tarrant, THPO)	Yes	Yes	None filed to date
Shawnee Tribe of Oklahoma (c/o Ron Sparkman, Chief; and Kim Jumper, Preservation Office)	Yes	Yes	None filed to date
Stockbridge-Munsee Community of Wisconsin (c/o Shannon Holsey, President; and Bonney Hartley, THPO)	Yes	No	None filed to date
Tonawanda Band of Seneca in New York (c/o Rodger Hill, Chief; and Kevin Jonathan, NAGPRA Contact)	Yes	Yes	None filed to date
Tuscarora Nation of New York (c/o Leo Henry, Chief; and Neil Patterson, Environmental Program)	Yes	Yes	None filed to date
United Keetoowah Band of Cherokee Indians (c/o Joe Bunch, Chief; and Lisa Stopp, THPO)	Yes	Yes	None filed to date
Upper Mattaponi Tribe in Virginia (c/o Frank Adams, Chief)	Yes	Yes	12/7/18 letter to FERC from Chief Frank Adams requested meeting with FERC staff
State-Recognized Native American Organizations			
Cheroenhaka-Nottoway Tribe in Virginia (c/o Walt Brown, Chief)	Yes	No	None filed to date

TABLE 4.10-2

Indian Tribes and Native American Organizations Contacted by the FERC for the Southgate Project

Indian Tribes or Native American Organizations (contacts)	Sent the FERC's 8/9/18 NOI	Sent Letter from FERC on 10/16/18	Responses to FERC Contacts
Cohaire Tribe in North Carolina (c/o Freddie Carter, Chief; and Greg Jacobs, Executive Director)	Yes	No	None filed to date
Haliwa-Saponi Tribe in North Carolina (c/o Ogletree Richardson, Chief; and Michael Richardson, Chair)	Yes	No	None filed to date
Lumbee Tribe of North Carolina (c/o Harvey Godwin, Chair; and Dock Locklear, Administrator)	Yes	No	None filed to date
Meherrin Indian Tribe in North Carolina (c/o Wayne Brown, Chief; and Jonathan Caudill, Chair)	Yes	No	None filed to date
Nottoway Indian Tribe in Virginia (c/o Lynette Allston, Chief)	Yes	No	4/11/19 letter to FERC requesting consultations
Occaneechi Band of the Saponi Nation (c/o W.A. Hayes, Chair; and Vicki Jeffries, Administrator)	Yes	No	10/15/18 letter to FERC requested meeting with FERC staff
Patawomeck Indians of Virginia (c/o John Lightner, Chief)	Yes	No	None filed to date
Sappony Tribe in North Carolina (c/o Otis Martin, Chief; and Dante Desiderio, Executive Director)	Yes	No	8/2/18, 11/16/18, and 2/25/19 letters to FERC requested meeting with FERC staff 7/1/19 letter to FERC commenting on cultural resources reports
Waccamaw Tribe in North Carolinia (c/o Lacy Freeman, Chief; and Brenda Moore, Coordinator)	Yes	No	None filed to date

a/ THPO = Tribal Historic Preservation Officer

In response to our NOI, we received comments from five federally-recognized tribes, one state-recognized Native American organization in Virginia, and two North Carolina state-recognized Native American organization. In response to our October 16, 2018 individual letters to tribal leaders, we received comments from five federally-recognized tribes. The Absentee Shawnee Tribe of Oklahoma made of finding of no adverse effects on historic properties, and has no objections to the Project. The Cherokee Nation of Oklahoma and Choctaw Nation of Oklahoma indicated that the Project area is outside of the tribes' AOI.

The Monacan Indian Nation, Nansemond Indian Tribe, and Upper Mattaponi Indian Tribe all requested meetings and site visits with FERC staff. FERC staff participated in a meeting with representatives of the Monacan Indian Nation in Richmond, Virginia on January 17, 2019.[29] On February 1, 2019, FERC staff participated in a telephone conference call with representatives of the Nansemond Indian Tribe.[30] FERC staff met with leaders of the Upper Mattaponi Tribe at their tribal office in King William, Virginia on April 24, 2019.[31]

In its February 20, 2019, letter to the FERC, the Monacan Indian Nation reiterated previous requests. The Nation asked for copies of cultural resources reports, and GIS shapefiles. Mountain Valley provided representatives of the Monacan Nation with a map of the pipeline centerline on October 18, 2018, and copies of survey reports on February 21, 2019.[32] The Nation questioned the number of cemeteries that may be affected by the Project. FERC staff, in an email to representatives of the Monacan Indian Nation indicated that there are about 12 cemeteries located along the pipeline route, that are documented in the inventory reports. FERC staff requested that Mountain Valley provide avoidance plans for all cemeteries; that would be forthcoming. The Nation requested that Mountain Valley's consultants become familiar with texts that cover Monacan history and culture; and Mountain Valley responded that they had reviewed the recommended texts. Mountain Valley representatives also visited the Monacan Museum. The Nation offered suggestions for revisions to the UDP; and requested the opportunity to further review the plan. As indicated in the notes on the meeting with the Nation, a copy of the UDP was included as part of Mountain Valley's application to the FERC, and is available for public review. In a letter to the FERC dated July 1, 2019, the Monacan Nation offered comments on cultural resources reports.

In letters dated August 2 and November 16, 2018, and February 25, 2019, the North Carolina state-recognized Sappony Tribe requested that FERC staff conduct meetings with the tribe. In a letter to the FERC dated July 1, 2019, the Sappony Tribe provided their comments on cultural resources reports. The North Carolina state-recognized Occaneechi Band of the Saponi Nation, in a letter to FERC, dated October 15, 2018, also requested meetings with FERC staff. In a letter to FERC, dated April 11, 2019, the state-recognized Nottoway Indian Tribe of Virginia expressed interest in the review of the Project.

We believe that the Nottoway Tribe, Sappony Tribe, and Occaneechi Band have a demonstrated interest in the cultural resources of the Project area; and, therefore, they could be consulting parties. We requested that Mountain Valley provide the Nottoway Tribe, Sappony Tribe, and Occaneechi Band with copies of archaeological investigation reports for the Southgate Project. The company provided reports to the Sappony Tribe and Occaneechi Band on February 21, 2019.

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29 The notes for the Monacan Indian Nation meeting can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190129-3045 in the "Numbers: Accession Number" field.

30 The notes for the Nansemond Tribe meeting can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190207-3104 in the "Numbers: Accession Number" field.

31 The notes for the Upper Mattaponi Tribe meeting can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190429-4000 in the "Numbers: Accession Number" field.

32 See Mountain Valley's March 5, 2019 responses to the FERC staff's February 13, 2019, EIR which can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190305-5214 in the "Numbers: Accession Number" field.

On April 23, 2019, Mountain Valley contacted the Nottoway Indian Tribe about receiving copies of cultural resources reports relating to the Project. Those Native American organizations can file their comments with the FERC, for consideration by staff. However, as of May 31, 2019, no comments from those organizations have been filed with the FERC regarding cultural resources investigations for the Project.

Communications Between Mountain Valley and Indian Tribes and Other Native Americans

Mountain Valley communicated with 26 federally-recognized Indian tribes and 11 state-recognized Native Americans organizations. Six federally-recognized Indian tribes responded back to Mountain Valley. Two North Carolina state-recognized Native American organizations responded to Mountain Valley's contact program. The Indian tribes and state-recognized Native American organizations contacted by Mountain Valley are listed in table 4.10-3 below. Mountain Valley sent an email dated November 2, 2018 to tribes or Native American organizations informing them about the Project. Mountain Valley provided copies of cultural resources survey reports to Indian tribes and Native American organizations that requested them. Mountain Valley organized a site visit for certain tribes and Native American organizations on March 14, 2019.

TABLE 4.10-3

Indian Tribes and Native American Organizations Contacted by Mountain Valley for the Southgate Project

Indian Tribes and Native American Organizations	Dates Contacted by Mountain Valley	Responses Back to Mountain Valley
Federally-Recognized Tribes		
Absentee Shawnee Tribe of Oklahoma	11/2/18	None filed to date
Catawba Indian Nation in South Carolina	5/31/18, 6/1/18, 6/28/18, 7/11/18, 8/31/18, 9/5/18, 9/28/18, 11/2/18; 2/6/19, 2/27/19	9/28/18 letter to Mountain Valley from Wenonah Haire, THPO, stated that the Tribe has no concerns about the Project's potential impacts on traditional cultural properties, sacred sites, or Native American archaeological sites
Cherokee Nation of Oklahoma	8/31/18, 11/2/18	None filed to date
Cheyenne River Sioux Tribe in South Dakota	6/6/18, 7/11/18, 8/31/18	None filed to date
Chickahominy Tribe in Virginia	5/31/18, 6/1/18, 6/12/18, 6/14/18,6/25/18 6/29/18, 7/11/18, 8/31/18, 9/6/18, 11/2/18; 2/6/19, 2/10/19, 2/27/19, 2/28/19	5/1/19 meeting between Mountain Valley and Stephen Adkins and Ruth Hennamen regarding investigations
Choctaw Nation of Oklahoma	11/2/18	None filed to date
Delaware Nation of Oklahoma	6/6/18, 7/11/18, 8/31/18, 11/2/18	None filed to date
Delaware Tribe of Oklahoma	6/6/18, 7/11/18, 11/2/18	6/7/18 email to Mountain Valley from Brice Obermeyer stating that the Project is outside the Tribe's AOI

TABLE 4.10-3

Indian Tribes and Native American Organizations Contacted by Mountain Valley for the Southgate Project

Indian Tribes and Native American Organizations	Dates Contacted by Mountain Valley	Responses Back to Mountain Valley
Eastern Band of Cherokee Indians in North Carolina	5/31/18, 6/1/18; 6/11/18, 6/29/18, 7/11/18, 8/31/18, 11/2/18; 2/6/19; 2/27/19, 2/28/19	6/29/18 email to Mountain Valley from Stehen Yerka requesting GIS shapefiles. 10/15/18 email to Mountain Valley from Stephen Yerka, Historic Preservation Specialist, stated that the Project is outside the designated traditional territory of the Tribe
Eastern Division of the Chickahominy Tribe in Virginia	5/31/18, 6/1/18, 6/12/18, 6/14/18, 8/21/18, 8/31/18, 9/6/18, 2/20/19, 2/27/19, 2/28/19, 4/16/19	None filed to date
Eastern Shawnee Tribe of Oklahoma	6/6/18, 7/11/18, 8/31/18, 11/2/18	None filed to date
Jena Band of Choctaw Indians in Louisiana	11/2/18	None filed to date
Mattaponi Tribe in Virginia	11/2/18	None filed to date
Monacan Indian Nation in Virginia	5/31/18, 6/1/18; 6/12/18, 6/27/18, 7/11/18, 8/9/18, 8/15/18, 8/31/18, 10/9/18, 11/2/18, 2/6/19, 2/21/19, 2/26/19, 2/28/18, 3/29/19, 4/16/19	8/7/18 email from Marion Werkheiser (Cultural Heritage Partners) stating that her law firm represents Monacan Nation 10/9/18 telephone call to Mountain Valley from Marion Werkheiser (Cultural Heritage Partners) requesting updated maps 2/21/19 two emails to Mountain Valley from Ellen Chapman (Cultural Heritage Partners) regarding ftp site access 2/21/19 email to Mountain Valley from Ellen Chapman (Cultural Heritage Partners) acknowledging receipt of survey reports through ftp online site 2/25/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding confidential report sharing 2/26/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding confidential report sharing 2/27/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding project information 4/18/19 telephone call between Mountain Valley and Ellen Chapman (Cultural Heritage Partners) regarding tribal site visit
Muscogee (Creek) Nation of Oklahoma	6/6/18, 7/11/18, 8/31/18, 11/2/18	6/8/18 email to Mountain Valley from LeeAnne Wendt stating that the Project is outside the Tribe's AOI

TABLE 4.10-3

Indian Tribes and Native American Organizations Contacted by Mountain Valley for the Southgate Project

Indian Tribes and Native American Organizations	Dates Contacted by Mountain Valley	Responses Back to Mountain Valley
Nansemond Tribe in Virginia	5/31/18, 6/1/18, 6/11/18, 6/26/18, 7/11/18, 8/31/18, 9/6/18, 11/2/18, 2/6/19, 2/10/19, 2/18/19, 2/27/19, 2/28/19, 4/16/19	6/11/18 email to Mountain Valley from Lee Lockamy with questions about the Project 4/29/19 telephone call between Mountain Valley and Sam Bass regarding meeting 5/1/19 meeting between Mountain Valley and Barry Bass in which he stated the tribe has no concerns at this point
Oneida Nation of Wisconsin	11/2/18	None filed to date
Ottawa Tribe of Oklahoma	11/2/18	None filed to date
Pamunkey Tribe in Virginia	5/31/18, 8/31/18, 11/2/18 2/6/19, 2/27/19, 2/28/19, 4/16/19	None filed to date
Poarch Band of Creek Indians in Alabama	11/2/18	None filed to date
Rappahannock Tribe in Virginia	5/31/18, 6/5/18, 7/11/18, 8/31/18, 9/6/18, 11/2/18, 2/6/19, 2/10/19, 2/27/19, 2/28/19, 4/16/19	9/6/18 5/10/2019 telephone call between Mountain Valley and Chief Anne Richardson regarding project
Rosebud Sioux Tribe in South Dakota	6/6/18, 6/7/18, 7/11/18, 8/31/18	None filed to date
Saint Regis Mohawk Tribe of New York	11/2/18	None filed to date
Seneca-Cayuga Nation of Oklahoma	11/2/18	None filed to date
Seneca Nation of Indians in New York	11/2/18	None filed to date
Shawnee Tribe of Oklahoma	11/2/18	None filed to date
Stockbridge-Munsee Community of Wisconsin	11/2/18	None filed to date
Tonawanda Band of Seneca in New York	11/218	None filed to date
Tuscarora Nation of New York	6/6/18, 7/11/18, 8/31/18	None filed to date
United Keetoowah Band of Cherokee Indians in Oklahoma	11/2/18	None filed to date
Upper Mattaponi Tribe in Virginia	5/30/18, 6/12/18, 6/25/18, 7/11/18, 8/31/18, 9/6/18, 11/2/18, 2/6/19, 2/27/19, 2/28/19, 4/16/19, 5/1/19	5/1/19 telephone call between Mountain Valley and Chief Adams regarding reports
State-Recognized Native Americans Organizations		
Cheroenhaka (Nottoway) Tribe in Virginia	8/3/18, 8/31/18, 11/2/18	None filed to date
Cohare Tribe in North Carolina	8/3/18, 8/31/18, 11/2/18	None filed to date
Haliwa-Saponi Indian Tribe in North Carolina	8/3/18, 8/31/18, 11/2/18	None filed to date
Lumbee Tribe in North Carolina	8/3/18, 8/31/18, 11/2/18	None filed to date
Meherrin Indian Tribe in North Carolina	8/3/18, 8/31/18, 11/2/18	None filed to date
Nottoway Tribe in Virginia	8/3/18, 8/31/18, 11/2/18, 4/23/19	4/23/19 email to Mountain Valley from Leroy Hardy confirming email received

TABLE 4.10-3

Indian Tribes and Native American Organizations Contacted by Mountain Valley for the Southgate Project

Indian Tribes and Native American Organizations	Dates Contacted by Mountain Valley	Responses Back to Mountain Valley
Occaneechi Band of the Saponi Nation in North Carolina	8/3/18, 8/6/18, 8/14/18, 8/20/18, 8/31/18, 10/2/18, 10/4/18, 11/2/18, 2/6/19, 2/21/19, 2/25/19, 4/15/19, 5/17/19	8/17/18 email to Mountain Valley from Tony Hayes with copy of letter Tribe sent to Alamance County 8/24/18 telephone call to Mountain Valley from Tony Hayes with invitation for company to speak to the Band 10/5/18 email to Mountain Valley from Tony Hayes regarding company presentation to Band 4/15/19 email from Tony Hayes confirming attendance at site visit 5/15/19 telephone call between Mountain Valley and Tony Hayes regarding delivery of reports
Patawomeck Tribe in Virginia	8/3/18, 8/31/18, 11/2/18	None filed to date
Sappony Tribe in North Carolina	8/3/18, 8/9/18, 8/15/18, 8/31/18, 10/9/18, 11/2/18, 2/6/19, 2/21/19, 2/26/19, 2/28/18, 3/29/19	8/7/18 email from Marion Werkheiser (Cultural Heritage Partners) stating that her law firm represents Sappony 10/9/18 telephone call to Mountain Valley from Marion Werkheiser, (Cultural Heritage Partners) requesting updated maps of Project 2/10/19 email to Mountain Valley from Charlene Martin of Sappony stating intention to attend 3/14/19 meeting and site visit 2/21/19 two emails to Mountain Valley from Ellen Chapman (Cultural Heritage Partners) regarding FTP site access 2/25/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding confidential report sharing 2/26/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding confidential report sharing 2/27/19 email from Ellen Chapman (Cultural Heritage Partners) to Mountain Valley regarding project information
Waccamaw Siouan Tribe in North Carolina	8/3/18, 8/31/18, 11/2/18	None filed to date

4.10.1.3 Communications with Other Agencies, Local Governments, and Historical Organizations

FERC Staff Consultations with Other Agencies, Local Governments, and Historical Organizations

In a filing on October 15, 2018, the NCDEQ provided the FERC with its comments on Mountain Valley's draft RR 4 (Cultural Resources).

We sent our NOI for the Project to nine local governments; three of which are CLGs,[33] listed in table 4.10-4. Only Alamance County, North Carolina provided the FERC with its comments on cultural resources issues.

TABLE 4.10-4

Local Governments Sent the FERC's August 9, 2018, NOI for the Southgate Project

Local Government/State	Responses to the NOI
Pittsylvania County, Virginia	None filed to date
City of Danville, Virginia (CLG)	None filed to date
Alamance County, North Carolina (CLG)	October 23, 2018 letter to FERC included a Resolution requesting that the EIS discuss the protection of cultural resources and historic structures
Rockingham County, North Carolina	None filed to date
City of Burlington, North Carolina	None filed to date
Town of Eden, North Carolina (CLG)	None filed to date
City of Graham, North Carolina	September 7, 2018 letter to FERC did not raise any cultural resources issues
Town of Haw River, North Carolina	None filed to date
City of Reidsville, North Carolina	None filed to date

[33] A local government can work through a certification program, jointly administered by the NPS and SHPOs, to become recognized as a CLG, and thus be eligible for federal and state historic preservation funds and technical assistance.

Our NOI also went out to nine local historical organizations, listed in table 4.10-5. Preservation Virginia and the Pittsylvania Historical Society responded with concerns.

TABLE 4.10-5

Local Historical Organizations Sent the FERC's August 9, 2018 NOI for the Southgate Project

Local Historical Organization/State	Responses to the NOI
Preservation Virginia	September 6, 2018 letter to FERC raised concerns about potential impacts on Little Cherrystone east of town of Chatham, and the plantations of Bachelors Hall, Oak Ridge, Oak Hill, Windsor, and Berry Hill along the Dan River near Berry Hill Road
Pittsylvania County Historical Society, Virginia	7/21/18
Alamance County Historical Museum, North Carolina	None filed to date
Graham Historical Museum, North Carolina	None filed to date
Haw River Historical Society and Museum, North Carolina	None filed to date
Haw River Heritage, North Carolina	None filed to date
Haw River Historical Development, North Carolina	None filed to date
Mebane Historical Society and Museum, North Carolina	None filed to date
Rockingham County Historical Society, North Carolina	None filed to date
Textile Heritage Museum, North Carolina	None filed to date

Appalachian Mountain Advocates wrote a letter to the FERC, dated September 10, 2018, which requested that our EIS should address "cultural attachment" to land.[34] In addition, it was suggested that the FERC should assess impacts on historic places and structures. Impacts on historic places and structures are addressed in this section of the EIS below.

[34] Cultural attachment "…is demonstrated in the intimate relationship (developed over generations of experiences) that people of a particular culture share with their landscape – for example, the geographic features, natural phenomena and resources, and traditional sites, etc., that make up their surroundings. This attachment to environment bears direct relationships to the beliefs, practices, cultural evolution, and identify of a people…." (Maly, 1999:27). Appalachian Mountain Advocates did not identify a community or cultural group along the Southgate pipeline route that for generations held specific beliefs and practices tied to any regional landscape features. There are no federal laws or regulations that require that cultural attachment should be addressed by an agency in the analysis of an undertaking. Therefore, we did not conduct a study of cultural attachment in this EIS.

Communications Between Mountain Valley and Local Governments and Historical Organizations

Mountain Valley communicated with three CLGs about cultural resources issues related to the Project, together with nine other local historical organizations, listed in table 4.10-6.

TABLE 4.10-6

Communications Between Mountain Valley and CLGs and Local Historical Organizations for the Southgate Project

Organization/State	Date of Communication	Type of Communication	Response
City of Danville, Virginia (CLG)	July 6, 2018	Letter	None filed to date
Town of Eden, North Carolina (CLG)	July 6, 2018	Letter	None filed to date
Alamance County Historical Properties Commission (CLG), and Alamance County, North Carolina	July 6, 2018	Letter	July 30, 2018 email request for GIS data
	August 3, 2018	Telephone call and email	Mountain Valley provided shapefile
Pittsylvania Historical Society, Virginia	July 6, 2018	Letter	July 21, 2018 email request for additional mapping data
	August 17, 2018	Email	Mountain Valley followed up about mapping review
Rockingham County Historical Society, North Carolina	July 6, 2018	Letter	October 2, 2018 telephone request for additional mapping data
	October 3, 2018	Email	Mountain Valley provided more detailed mapping data
Alamance County Historical Museum, North Carolina	July 6, 2018	Letter	None filed to date
Textile Heritage Museum, North Carolina	July 6, 2018	Letter	None filed to date
Haw River Historical Association Museum, North Carolina	July 6, 2018	Letter	None filed to date
Graham Historical Museum, North Carolina	July 6, 2018	Letter	July 21, 2018 email provided updated contact information
Mebane Historical Society and Museum, North Carolina	July 6, 2018	Letter	None filed to date
Virginia-North Carolina Piedmont Genealogical Society	August 19, 2018	Letter	None filed to date
Afro-American Historical and Genealogical Society of North Carolina	August 21, 2018	Letter	None filed to date

A number of private citizens also commented to the FERC during the scoping period, including at the public scoping meetings, about cultural resources issues, as listed in table 4.10-7.

TABLE 4.10-7

Comments to FERC from Private Citizens During Scoping About Cultural Resources Issues for the Southgate Project

Name	Date Filed	Accession No.	Comment
Letters Filed			
Mel Aldridge and Angela Hinton	August 30, 2018	20180830-0008	Their property has two buildings listed on the Alamance County Architectural Inventory as Historic Places and two family cemeteries dating before 1835
William Fonville	September 5, 2018	200180905-0027	Home was built in late eighteen hundreds
Bruce and Susan Taylor	September 6, 2018	20180906-0014	Historic site (Burlington-Hillsborough Stage Coach Trail) on property
Abigayle Faulkner	September 10, 2018	20180910-5050	Archaeological site 31AM431 on property
Kate Buble	September 10, 2018	20180910-5120	Concerned about impacts on Haw River Trail, Glencoe Mill Village, and Arches Grove United Church of Christ
Susan Moore	September 12, 2018	20180912-0008	Farm dates back to 1810 and includes family cemetery and Native American archaeological site
Statements Made at Public Scoping Meetings			
Susan Moore	Reidsville, NC	August 20, 2018	Farm dates back to 1810. There is a family cemetery on the property
William Hunt	Reidsville, NC	August 20, 2018	He is Native American (Lumberton). The Haliwa Tribe is in the area. Project should not interfere with the use of sacred burial grounds. There is a native graveyard on land of neighbor Slate Stones
Jake Helms	Reidsville, NC	August 20, 2018	Home sits within Car Scott Farm dating to 1760s, listed on state historic register and federal NRHP
Michelle Morris	Haw River, NC	August 23, 2018	Home of Governor Scott, designed and built by Jessie Ray – Car Scott Farm (AM641) on NRHP
Patsy Madrin	Haw River, NC	August 23, 2018	Family has been on land since 1819. Sissiphaw Indians on land, found Native American artifacts

4.10.2 Identification of Historic Properties

4.10.2.1 Area of Potential Effect

As stated in our NOI, we define the direct APE as all areas subject to ground disturbance, including the construction right-of-way, additional temporary extra workspaces, contractor/pipe storage yards, staging areas, disposal areas, aboveground facilities, and new or to-be-improved access roads. As indicated on table 2.3-1 of this EIS, construction of all elements of this Project would impact a total of about 1,448 acres. An indirect APE was also established by Mountain Valley based on viewsheds around proposed Project facilities. The indirect APE should include all areas potentially subjected to the introduction of visual, atmospheric, or audible elements from the Project that may diminish the integrity or character of a nearby historic property.

Direct Area of Potential Effect

Mountain Valley defined the direct APE to be a 300-feet-wide corridor where the Project would not be collocated with an existing right-of-way, and a 400-feet-wide corridor where it would be collocated. The direct APE also includes a 50-foot-wide corridor centered along the proposed access roads, additional workspaces, staging areas, yards, and the limits of proposed compressor station site and other aboveground facilities.

Indirect Area of Potential Effect

Mountain Valley defined the indirect APE to be a 450-foot-wide corridor centered on the H-605 and H-650 pipeline routes, a 250-foot-wide corridor centered on access roads, and a maximum 0.5-mile area around aboveground facilities. However, in its architectural survey reports, Mountain Valley's consultant (TRC, Karpynec et al., 2018a; Karpynec et al., 2018b) expanded the indirect APE to 0.5-mile along the pipeline.

4.10.3 Results of Cultural Resources Investigations

Below is a brief summary of cultural resources overviews, inventories, and evaluations that contribute to the identification of historic properties in the APE. Mountain Valley submitted copies of reports of investigation results with the FERC, SHPOs, interested Indian tribes, and other consulting parties.

4.10.3.1 Cultural Context

Native Americans occupied North America for many thousands of years before European exploration and settlement. The archaeological expression of the Late Woodland/Protohistoric period in the Project area is known as the Dan River Phase, characterized by Dan River ceramics (ca. AD 1000 – 1450; Eastman, 1999). In Virginia, the Dan River Phase was found at Belmont (44HR3), Box Plant (44HR2), Dallas Hylton (44HR20), Gravely (44HR29), Koehler (44HR6), Leatherwood Creek (44HR1), Stockton (44HR35), and Wells (44HR9) archaeological sites. During the surveys for the Project in Virginia, Dan River ceramics were recovered at archaeological sites 44PY270, 44PY447, 44PY449, and isolated find VA-FS-31 (Blood et al., 2019). In North Carolina, Hairston (31SK1) is an example of an archaeological site with a Dan

River Phase component. The Project surveys and testing found Dan River ceramics at archaeological sites 31AM428, 31RK97, 31RK217, 31RK222, and 31RK259 in North Carolina (Johnson et al., 2019; Johnson, 2019).

The permanent European settlement of Virginia was initiated with the establishment of Jamestown by the English in 1607. Pittsylvania County was created in 1767, and the county seat moved to Chatham in 1777.

At the beginning of the contact period, tidewater Virginia was dominated by the Algonquin Powhatten confederacy (Roundtree, 1990). In the piedmont of Virginia, other Indian tribes included the Manahoac, Monacan, Tutelo, Sapponi, and Occaneechi (Demallie, 2004).[35] In 1608, John Smith, one of the original Jamestown leaders, met the Manahoac and Monacan and mapped their village locations (Hantman, 2018). John Lederer, a German explorer, encountered the Monacan, Saponi, and Occaneehee in 1670. The Virginian traders Thomas Batts and Robert Fallon in 1671 reached the Tutero village (Briceland, 1987). Monacan chiefs signed the Treaty of Middle Plantation in 1680. Contact period archaeological sites in Virginia include 44AB416, Hurt Power Plant (44PY144), Philpott (44HR4), and Graham-White (44RN21).[36]

The archaeological expression of the contact period in North Carolina is known as the Saratown Phase (ca. AD 1450 to 1710). Contact period aboriginal archaeological sites in North Carolina are characterized by Oldtown, Jenrette, and Hillsboro ceramics (Millis, 2019a). Archaeological sites along the Dan River which informed this period include Upper Saratown (31SK1a), Lower Saratown (31RK1), Madison (31RK6), and William Kluttz (31SK6) (Eastman, 1999). John Lederer visited the Sara Indians in 1670, and the locations of Upper Saratown and Lower Saratown were illustrated on the Fry and Jefferson map of 1751. Lederer also met with the Shakori. The Jenrette site on the Eno River may represent the Shakori village visited by Lederer.

In the piedmont of northcentral North Carolina during the contact period, the Saxapahaw (or Sissipahaw) were said to be on the Haw River, with the Eno, Shakori, and Shoccoreeon on the Eno River and head of the Neuse River. John Lawson encountered the Eno, Keyauwee, and Sissipahaw Indians in North Carolina during his travels in 1700-1701. The Fredericks site on the Eno River may represent one of the villages visited by Lawson, while the Mitchum site on the Haw River may be the remains of a Sissipahaw village (Millis, 2019a). These groups later amalgamated with the Catawba Indians, who were focused mostly on the Catawba River (Rudes et al., 2004).

The permanent English colonization of North Carolina began with the establishment of the Albemarle District, with settlements on the Chowan and Roanoke Rivers, beginning in 1653. After 1728, William Byrd, who surveyed the Virginia-North Carolina border, enticed settlement of his 20,000 acre grant near Eden. The region's first Euro-American settlers came from the Mid-Atlantic colonies, and were of German, English, Scottish, and Irish descent. Rockingham County was

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[35] The Saponi and Tutelo probably spoke similar dialects within the Siouan-Catawban language family, The Monacan and Manahoac had no demonstrated linguistic affiliation with the Siouian language family, but did have political and trade associations with the Tutelo, Sapponi, and Occaneechi (Woodard et al., 2017). In a letter to the FERC dated July 1, 2019, the Monacan Indian Nation asserts that the Occaneechi Path trade route connected Monacan villages with Tutelo-Sapponi communities such as Occaneechi Town.

[36] The Monacan Indian Nation asserts that Hantman (2018) believes that the Hurt Power Plant site (44PY144) and the Graham-White site (44RN21) are probably associated with the Monacan.

created in 1785, with the county seat established at Wentworth in 1798. Alamance County was created out of Orange County in 1849. This area was first settled by religious dominations, with Quakers at Cane Creek, German Reformed and Lutherans near Stinking Quarter Creek, and Presbyterians at Hawfields. A tax revolt by small landowners, known as "regulators," was suppressed by the North Carolina colonial militia under Governor William Tryon in the Battle of Alamance in May 1771.

In the discussion below, we refer to Native American archaeological sites as "prehistoric" or "pre-contact," while non-native colonial and more recent archaeological remains are called "historic," and post-contact buildings and structures are labeled "historic architectural" sites.

4.10.3.2 Overview

Mountain Valley stated that site file searches were conducted by TRC at the VADHR and the NCDNCR and North Carolina Office of State Archaeology (NCOSA) in April and September 2018.

Literature Reviews and Site File Searches in Virginia

In Virginia, Mountain Valley identified 82 previously recorded archaeological sites and 79 previously recorded historic architectural sites within 0.5 mile of Project facilities. Thirty-two of the previously recorded archaeological sites were mapped within 200 feet of facilities (roughly corresponding to the direct APE); however, only 7 of these were relocated during the Project surveys.

Forty of the previously recorded historic architectural sites in Pittsylvania County, Virginia, were determined to be inside the direct APE and 69 were determined to be within 0.5 mile of centerline (roughly corresponding to the indirect APE). Mountain Valley field survey crews revisited 17 of the previously recorded historic architectural sites for the Project in Virginia, of which 16 are within the direct APE and one is within the indirect APE.

Literature Reviews and Site File Searches in North Carolina

In North Carolina, Mountain Valley identified 68 previously recorded archaeological sites, and 104 previously recorded historic standing structures within 0.5 mile of the proposed Project facilities in North Carolina. Sixteen of the previously recorded archaeological sites were mapped within 200 feet of facilities (e.g., direct APE); however, only two of these were relocated during the Project surveys (31RK44 and 31RK97).

Twenty-seven of the previously recorded historic architectural sites were identified by Mountain Valley to be within the direct APE and 103 were determined to be within 0.5 mile of centerline (e.g., indirect APE) in North Carolina. Mountain Valley field survey crews revisited 30 previously recorded historic architectural sites, of which 17 are in the direct APE and 13 are in the indirect APE.

4.10.3.3 Inventories

As of May 7, 2019, Mountain Valley had surveyed a total about 69 miles of pipeline route for the Project; the compressor station; 2 interconnects; 5 yards; and about 30 miles of access roads in Virginia and North Carolina combined.

Investigations in Virginia

As of September 2018, Mountain Valley had inventoried about 26 miles of the Project pipeline route in Virginia (98 percent); the Lambert Compressor Station; two MLV sites (MLV-2 and MLV-3); one contractor yard (CY-01); and approximately 22 miles of access roads (Blood et al., 2019). A total of 17,810 shovel tests were excavated as part of the 2018 archaeological surveys; of which 124 probes produced artifacts. Mountain Valley identified 42 archaeological resources within the direct APE in Virginia, including 23 archaeological sites and 19 isolated finds. The archaeological sites include 12 prehistoric, 4 historic, and 65 multi-component resources. The isolated finds consist of 18 prehistoric artifacts and 1 historic item.

After its 2018 surveys, TRC recommended that 15 of the isolated finds and 11 archaeological sites are not eligible for listing on the NRHP (Blood et al., 2019). In a letter dated February 13, 2019, reviewing TRC's draft Phase I archaeological survey report for Virginia, the VADHR evaluated all the isolated finds but one as not eligible; with additional work required at one resource (VA-FS-30). The VADHR concurred with TRC that 11 archaeological sites are not eligible for the NRHP. We agree with the Virginia SHPO. The Project should have no effect on ineligible sites; and no further work is necessary at those resources.

After its 2018 surveys, TRC recommended that four isolated finds and 12 archaeological sites in Virginia are unevaluated. The VADHR, in its February 13, 2019 letter reviewing the survey report, assessed nine archaeological sites as being potentially eligible and three sites as unevaluated.

Between July and September 2018, TRC tested six sites in Virginia. After testing, TRC changed its evaluations, and assessed five sites that were formerly of unknown status (44PY271, 44PY375, 44PY445, 44PY451, and 44PY455) as being not eligible for the NRHP (Millis 2019b, 2019c). Site 44PY449 was reassessed to be eligible and should be avoided or mitigated. The potentially eligible and unevaluated sites should be avoided or tested. In letters to TRC dated May 10 and May 16, 2019, the VADHR concurred that site 44PY271 is not eligible for nomination to the NRHP; however, site 44PY449 is eligible for the NRHP. Furthermore, the VADHR deferred their NRHP eligibility determination for sites 44PY375, 44PY445, 44PY451, 44PY455 because the sites extend outside the APE and have not been fully delineated. However, the VADHR determined that the portions of 44PY375, 44PY445, 44PY451, and 44PY455 within the APE are not significant and no further investigations for the portions within the APE are warranted. We agree with the Virginia SHPO. Table 4.10-8 below lists the archaeological sites identified by TRC for Mountain Valley in the direct APE in Virginia and their evaluations.

TABLE 4.10-8

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
44PY261 a/	Historic artifact scatter	Not eligible	Not eligible (2/13/19)	None
44PY270 a/	Prehistoric camp with Woodland occupation	Unassessed	Potentially eligible (2/13/19)	Avoid or test
44PY271 a/	Prehistoric lithic scatter	After testing – Not eligible	Not eligible (5/10/19)	None
44PY281 a/	Prehistoric lithic scatter	Unassessed	Potentially eligible (2/13/19)	Avoid or test
44PY358 a/	Multi-component: Prehistoric lithic scatter; and Historic isolated find	Unassessed	Unevaluated (2/13/19)	Avoid or test
44PY375 a/	Multi-component: Prehistoric lithic scatter; and Historic farmstead	After testing – Not eligible	Potentially eligible (2/13/19)/Portion in APE not significant (5/16/19)	None
44PY442 a/	Historic farmstead	Not eligible	Not eligible (2/13/19)	None
44PY445 b/	Historic farmstead	After testing – Not eligible	Potentially eligible/Portion in APE not significant in APE (5/10/19)	None
44PY446 b/	Prehistoric lithic scatter with an Early Woodland occupation	Not eligible	Not eligible (2/13/19)	None
44PY447 b/	Prehistoric lithic scatter with an Late Archaic and Woodland occupations	Unassessed	Potentially eligible (2/13/19)	Avoid or test
44PY448 b/	Prehistoric lithic scatter	Not eligible	Not eligible (2/13/19)	None
44PY449 b/	Multi-component: Prehistoric lithic scatter with Woodland occupation; and Historic isolated find	After testing - Eligible	Potentially eligible (2/13/19)	Avoid or mitigate
44PY450 b/	Prehistoric lithic scatter	Not eligible	Not eligible (2/13/19)	None
44PY451 b/	Multi-component: Prehistoric lithic scatter; and Historic farmstead	After testing – Not eligible	Potentially eligible/Portion in APE not significant (5/10/19)	None
44PY452 b/	Prehistoric lithic scatter with Woodland occupation	Unassessed	Unevaluated (2/13/19)	Avoid or test

TABLE 4.10-8

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
44PY453 b/	Multi-component: Prehistoric lithic scatter; and Historic isolated find	Not eligible	Not eligible (2/13/19)	None
44PY454 b/	Historic structural ruins	Unassessed	Potentially eligible (2/13/19)	Avoid or test
44PY455 b/	Historic structural ruins	After testing – Not eligible	Potentially eligible (2/13/19)/Portion in APE not significant (5/16/19)	None
44PY456 b/	Multi-component: Prehistoric lithic scatter with Woodland occupation; and Historic artifact scatter	Not eligible	Not eligible (2/13/19)	None
44PY457 b/	Prehistoric lithic scatter	Not eligible	Not eligible (2/13/19)	None
44PY458 b/	Prehistoric lithic scatter	Not eligible	Not eligible (2/13/19)	None
44PY459 b/	Prehistoric camp with Early Archaic occupation	Not eligible	Not eligible (2/13/19)	None
44PY460 b/	Prehistoric camp with Early Archaic occupation	Not eligible	Not eligible (2/13/19)	None

a/ Previously recorded site relocated by Mountain Valley

b/ Site newly recorded by Mountain Valley during 2018 surveys

TRC identified a total of 49 historic architectural sites in the direct APE in Virginia. Sixteen of those were previously recorded. Twenty-nine historic architectural sites were found in the direct APE along the proposed pipeline route, two were found at a yard, and 18 were found in the direct APE along proposed access roads. Combined, the historic architectural sites in the direct APE in Virginia include 34 houses, 4 barns and sheds, 8 cemeteries, 1 church, 1 commercial building, and 1 railroad (Karpynec et al., 2018a).

TRC evaluated 44 historic architectural sites in the direct APE in Virginia as being not eligible for the NRHP. In a letter dated February 13, 2019, the VADHR disagreed with TRC and found site 71-5212 eligible. Likewise, the VADHR disagreed with TRC, and stated that sites 71-5227, 5598, and 5620 should be treated as eligible, and should either be avoided or have Phase II investigations conducted. The VADHR concurred with the other sites that TRC recommended as not eligible for the NRHP. The Project should have no effects on non-eligible sites; and those resources require no further work.

One historic architectural site along the pipeline route in Virginia is listed in the NRHP (71-36, Little Cherrystone Manor/Wooding Cemetery). TRC recommended that three other historic architectural sites (71-5571, Batterman Farmstead; 71-5572, 376 Batterman Road; and 71-5222, 251 Samuel Harris Road) in the direct APE in Virginia should be considered eligible for listing in the NRHP. However, the VADHR, in a letter dated February 13, 2019, reviewing Mountain Valley's 2018 historic architectural survey report for Virginia, disagreed with TRC, and found sites 71-5571 and 71-5572 to be not eligible. The VADHR concurred that site 71-5222 is potentially eligible. TRC recommended that site 71-5217 is of undetermined eligibility and requires additional investigations; and the VADHR concurred that the site was potentially eligible, and the site should be avoided or Phase II investigations conducted. We agree with the findings of the Virginia SHPO. Mountain Valley should avoid NRHP-listed or eligible historic architectural sites in Virginia; or produce site-specific treatment plans to mitigate adverse impacts. Table 4.10-9 below lists the historic architectural sites identified by TRC for Mountain Valley in the direct APE in Virginia and their evaluations.

TABLE 4.10-9

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
Along Pipeline Route					
71-36 Little Cherrystone Manor/Wooding Cemetery	House (1800) and cemetery	(1969) TRC (2018)	Listed in NRHP	2/13/19 Listed in NRHP	Avoid or mitigate
5033 Belle Grove Church	Church and cemetery (1940)	VDOT (1997) TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
5208	House (1946)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5209	House (1945)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5210	House (1935)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5211	Farm with house (1880)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5212	Farm with house (1923)	Berger (2006) TRC (2018)	Not eligible	2/13/19 Eligible	Avoid or mitigate
5218	House (1900)	Berger (2006) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5225 (44PY284) Wells Cemetery	Cemetery (1910-1940)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
5226 (44PY272)	Cemetery	Berger (2006) TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
5227 (44PY273) Wallor Family Cemetery	Cemetery (1812-1894)	Berger (2005) TRC (2018)	Not eligible	2/13/19 Treat as eligible	Avoid or Phase II
5566	Tobacco barn	TRC (2018)	Not eligible	2/13/19 Not eligible	None

TABLE 4.10-9

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
5567	Farm with house (1952)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5585	House (1965)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5586	House (1965)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5588	House (1950)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5594	House (1936)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5595	Farm with houses (1960)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5597	House (1940)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5598 Norfolk Southern Railroad	Active railroad (1894)	TRC (2018)	Not eligible	2/13/19 Treat as eligible	Avoid or Phase II
5599	House (1964)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5600	Tobacco barn	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5601	Storage shed associated with mobile home	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5602	House (1888)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5603	Commercial building (1968)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5604	House (1964)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5615	House (1960)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5622	Cemetery (1918)	TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
5623	Cemetery	TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
Within Yards and Staging Areas					
71-5525	Cemetery associated with Gafford house	New South Associates (2017) TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid

TABLE 4.10-9

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
5526 Gafford House	House (1850)	New South Associates (2017) TRC (2018)	Not eligible	6/27/17 Not eligible 2/13/19 Not eligible	None
Along Access Roads					
71-5217	Farm with house (1888)	Berger (2006) TRC (2018)	Undetermined	2/13/19 Potentially eligible	Avoid or Phase II
5222 Giles Log House	House (1930)	Berger (2006) TRC (2018)	Potentially eligible	2/13/19 Potentially eligible	Avoid or Phase II
5521	Farm with house (1900)	Berger (2006) TRC (2018)	Not eligible	2/13/19 Not eligible	None
5570	Farm with house (1920)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5571 Batterman Family Farm	Farm with house (1920)	TRC (2018)	Eligible	2/13/19 Not eligible	None
5572	House (1939)	TRC (2018)	Potentially eligible	2/13/19 Not eligible	None
5581	Farm with house (1935)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5582	Farm with house (1950)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5583	Farm with house (1870)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5584	Farm with house (1940)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5592	Tobacco barn	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5596	Cemetery	TRC (2018)	Not eligible	2/13/19 Not eligible	Avoid
5606	House (1880)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5609	Farm with house (1910)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5612	Farm with house (1870)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5614	House (1900)	TRC (2018)	Not eligible	2/13/19 Not eligible	None
5618	House (1966)	TRC (2018)	Not eligible	2/13/19 Not eligible	None

TABLE 4.10-9

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in Virginia

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
5619	Tobacco barn	TRC (2018)	Not eligible	2/13/19 Not eligible	None

Investigations in North Carolina

As of September 2018, Mountain Valley had inventoried in North Carolina about 36 miles of proposed pipeline route, the T-15 Dan River Interconnect, five MLVs (MLV-4, MLV-5, MLV-6, MLV-7, and MLV-8), one contractor yards (CY-04), and approximately 21 miles of access roads.

A total of 7,802 shovel tests were excavated during the original 2018 surveys in North Carolina; with 90 probes producing artifacts (Johnson et al., 2019). Between October 2018 and February 2019, TRC conducted additional surveys in North Carolina, covering a total of 9.4 miles of pipeline route in 53 segments. Also inventoried were a total of about 49 acres at 3 yards; 2 acres at 2 anode beds; 13 acres at 14 ATWS; 37 access roads totaling about 10 miles. Additionally, 1,392 shovel tests were excavated (Johnson, 2019).

As of May 22, 2019, 42 archaeological sites and 38 isolated finds have been identified in the direct APE in North Carolina. Twenty-two sites are prehistoric, 13 are historic, and 5 are multi-component. Of the isolated finds, 32 are prehistoric artifacts, two are historic items, and two contain both prehistoric and historic items. Two historic isolated finds are located within archaeological prehistoric sites. Additionally, two of the sites contain historic isolated finds, which were included in the counts of sites.

Twenty-eight of the isolated finds and 28 archaeological sites were recommended by TRC to be not eligible for the NRHP. In a letter dated December 20, 2018, reviewing Mountain Valley's first survey report for North Carolina, the NCDNCR found 44 resources to be not eligible for the NRHP. According to the NCDNCR, two archaeological sites (31AM435 and 31RK244) are not eligible within the direct APE, but are unassessed outside. TRC recommended that five isolated finds (31RK238, 31RK240, 31RK263, 31RK264, and 31RK265) require further investigations if they cannot be avoided. The NCDNCR found two prehistoric isolated finds (31RK238 and 31RK240) to be not eligible within the direct APE, but they should be tested to evaluate if they contain deeply buried cultural deposits. After archaeological testing at 31RK221 and 31RK238, TRC recommended them to be not eligible for the NRHP (Millis 2019d). In a letter to TRC dated April 15, 2019, the NCDNCR agreed that the portions of sites 31RK221 and 31RK238 in the APE are not eligible for nomination to the NRHP. The Project should have no effect on ineligible sites; and no further work should be necessary at those resources.

TRC assessed 12 archaeological sites as unevaluated; and those sites should be avoided or tested (Johnson et al., 2019; Johnson, 2019). Five historic cemeteries are unassessed; but they should be avoided by the Project.

In a letter to TRC, dated May 7, 2019, reviewing the first draft addendum survey report for North Carolina, the NCDNCR stated that sites 31AM438, 31AM439, and 31AM440, and 31RK262, 31RK266, 31RK267, and 31RK269 are not eligible within the APE. Site 31AM219 was not relocated in the APE. Site 31AM443 is a historic cemetery that is not eligible, but should be avoided. Sites 31RK263 and 31RK265 are outside the APE and should be avoided. Sites 31AM441, 31AM442, 31RK97, and 31RK264 require additional investigations. We agree with the findings of the North Carolina SHPO.

Mountain Valley conducted testing at archaeological sites 31RK222, 31RK259, and 21RK261, and additional deep testing along Town Creek in Rockingham County, North Carolina. Sites 31RK222 and 31RK259 were evaluated to be eligible for nomination to the NRHP and avoidance or mitigation was recommended. Site 31RK261 was also evaluated as eligible, but TRC believes the portion of the site within the direct APE does not contribute to its significance. The deep testing at Town Creek identified isolated finds 31RK258 and 31RK260, and a prehistoric component at site 31RK245. Site 31RK245, and isolated finds 31RK258 and 31RK260 were evaluated as being not eligible for the NRHP (Millis, 2019a). The North Carolina SHPO concurred with these recommendations in their letter dated May 24, 2019.

Table 4.10-10 below lists the archaeological sites identified in the direct APE in North Carolina and their evaluations.

TABLE 4.10-10

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
Alamance County				
31AM414	Multi-component: Prehistoric lithic scatter with Archaic occupation; and Historic artifact scatter	Unassessed	Unassessed (12/20/18)	Avoid or test
31AM416	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31AM424	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31AM425	Prehistoric lithic scatter with a Middle Archaic occupation	Not eligible	Not eligible (12/29/18)	None
31AM426	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31AM427	Historic ruins	Not eligible	Not eligible (12/29/18)	None
31AM428	Multi-component: Prehistoric lithic scatter with a Woodland occupation; and Historic artifact scatter	Not eligible	Not eligible (12/29/18)	None

TABLE 4.10-10

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
31AM432	Prehistoric lithic scatter with a Woodland occupation;	Not eligible	Not eligible (12/29/18)	None
31AM435	Prehistoric lithic scatter with Middle and Late Archaic occupations	Not eligible	Not eligible in direct APE; unassessed outside (12/20/18)	None
31AM437	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31AM438	Multi-component: Prehistoric lithic scatter; and Historic artifact scatter	Not eligible	Not eligible in APE (5/7/19)	None
31AM439	Historic structure and artifact scatter	Not eligible	Not eligible in APE (5/7/19)	None
31AM440	Prehistoric lithic scatter	Not eligible	Not eligible (5/7/19)	None
31AM441	Prehistoric lithic scatter with Woodland occupation	Unassessed	Needs additional investigations (5/7/19)	Avoid or test
31AM442	Prehistoric lithic scatter with Woodland occupation	Unassessed	Needs additional investigations (5/7/19)	Avoid or test
31AM443	Dep Creek Primitive Baptist Church cemetery	Unassessed	Not eligible (5/7/19)	Avoid
Rockingham County				
31RK44	Multi-component: Prehistoric lithic scatter with Woodland occupation; and Historic artifact scatter	Unassessed	Unassessed (12/20/18)	Avoid or test
31RK97 a/	Prehistoric lithic scatter with Middle Archaic and Late Woodland occupations	Unevaluated	Needs additional investigations (5/7/19)	Avoid or test
31RK216	Historic cemetery	Not eligible	Unassessed (12/20/18)	Avoid
31RK217	Prehistoric lithic scatter with Late Woodland occupation	Unassessed	Unassessed (12/20/18)	Avoid or test
31RK220	Historic ruins and artifact scatter	Not eligible	Not eligible (12/29/18)	None
31RK221	Historic ruins and artifact scatter	After testing – Not eligible	Unassessed (12/20/18)	None

TABLE 4.10-10

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
31RK222	Prehistoric lithic scatter with a Woodland occupation	After testing - Eligible	Eligible 5/24/19	Avoid or mitigate
31RK225	Prehistoric lithic scatter with a Woodland occupation	Not eligible	Not eligible (12/29/18)	None
31RK226	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31RK228	Historic cemetery	Not eligible	Unassessed (12/20/18)	Avoid
31RK229	Historic ruins and artifact scatter	Unassessed	Unassessed (12/20/18)	Avoid or test
31RK230	Historic ruins and artifact scatter	Unassessed	Unassessed (12/20/18)	Avoid or test
31RK234	Historic cemetery	Unassessed	Unassessed (12/20/18)	Avoid
31RK237	Historic cemetery	Not eligible	Unassessed (12/20/18)	Avoid
31RK239	Prehistoric lithic scatter	Unassessed	Unassessed (12/20/18)	Avoid or test
31RK242	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31RK243	Prehistoric lithic scatter with Late Archaic occupation	Not eligible	Unknown	None
31RK244	Historic ruins and artifact scatter	Not eligible	Not eligible in direct APE; unassessed outside (12/20/18)	None
31RK245	Multi-component: Prehistoric lithic scatter; and Historic ruins and artifact scatter	After testing – Not eligible	Not eligible (12/29/18)	None
31RK247	Multi-component: Prehistoric lithic scatter; and Historic artifact scatter	Unassessed	Unknown	None
31RK249	Prehistoric lithic scatter	Not eligible	Not eligible (12/29/18)	None
31RK259	Prehistoric lithic scatter with a Woodland occupation	After testing - Eligible	Eligible (5/24/19)	Avoid or mitigate
31RK261	Prehistoric lithic scatter with a Woodland occupation	After testing -- Eligible – non-contributing in APE	Eligible (5/24/19)	Fence and protect

TABLE 4.10-10

Archaeological Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Cultural Type	TRC Evaluation	SHPO Evaluation (Date)	Future Work
31RK262	Prehistoric lithic scatter	Not eligible	Not eligible (5/7/19)	None
31RK266	Prehistoric lithic scatter	Not eligible	Not eligible in APE (5/7/19)	None
31RK268	Prehistoric lithic scatter	Not eligible	Not eligible in APE (5/7/19)	None

a/ Previously recorded

Mountain Valley identified a total of 83 historic architectural sites in the direct APE in North Carolina as of March 2019. This includes 12 historic sites in the direct APE along the pipeline route in Rockingham County, 27 sites along the pipeline route in Alamance County, 2 sites at yards in Rockingham County, 14 sites in the direct APE along access roads in Rockingham County, and 28 sites along access roads in Alamance County. Sixty-one of the historic architectural sites are houses, 1 is a hunting cabin, 3 are barns, 1 is a church, and 17 are commercial structures. TRC recommended that 76 of the historic archaeological sites in the direct APE are not eligible for the NRHP (Karpynec et al., 2018b), and the North Carolina SHPO concurred with those recommendations. The Project would have no effect on non-eligible sites; and no further work is required at those sites.

In a letter dated December 20, 2018, reviewing Mountain Valley's historic architectural survey report for North Carolina, the NCDNCR disagreed with TRC's recommendation of not eligible for two sites (AM2407/2408 Tabardrey Mill; and RK1704 American Tobacco Company plant), believing them to be unevaluated until more information is provided. The NCDNCR concurred that one site (AM1520 J.M. Jordan House) is unassessed, and four sites are potentially eligible (AM203/1516 T.M. Holt Mill; AM266 Jim McClure House; AM350 Robertson House; and AM447 Captain Sam Vest House). Those sites should be avoided, or more information should be provided to clarify their eligibility. One site (AM867 Granite Mill) is listed in the NRHP. That site should be avoided or impacts mitigated. We agree with the findings of the North Carolina SHPO with regards to eligibility and effects for historic architectural sites within the Project's direct APE in the state.

Between September 2018 and April 2019, Mountain Valley had its contractor conduct additional historic architectural surveys covering route changes, new access roads, and yards. The results of those investigations were filed as an addendum report with the FERC and the SHPO in May 2019. The addendum survey identified 98 historic architectural resources in the indirect APE, and 29 sites in the direct APE. Of the sites in the direct APE, 23 are houses, 3 are commercial structures, 1 is a barn, and 2 are railroads. Nine of the sites in the direct APE are along the pipeline, 11 are along access roads, and 9 are in or near yards. All of the structures identified in the direct APE in the addendum report were evaluated as not eligible for the NRHP; requiring no further work (Karpynec, 2019). The North Carolina addendum historic architectural survey report has not yet been reviewed by the SHPO. Table 4.10-11 below lists the historic architectural sites identified in the direct APE in North Carolina and their evaluations.

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
ALONG PIPELINE ROUTE					
Alamance County					
AM122 **a/**	House (1948)	Barkau (2002) TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM203/1516 **a/** T.M. Holt Mfg	Textile mill (1844)	NCDAH (1978) TRC (2018)	Potentially eligible	12/20/18 Likely eligible	Needs further evaluation study
AM225 **a/** Triple A Mill House	House (1890)	Alamance County (1978) TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM266 **a/** Jim McClure House	House (1897)	Alamance County (1978) TRC (2018)	Potentially eligible	12/20/18 May be eligible	Interior needs to be evaluated
AM350 **a/** Robertson House	House (1890)	Alamance County (1978) TRC (2018)	Potentially eligible	12/20/18 May be eligible	Interior needs to be evaluated
AM447 **a/** Captain Sam Vest House	House (1896)	Alamance County (1978) TRC (2018)	Potentially eligible	12/20/18 May be eligible	Interior needs to be evaluated
AM867 **a/** Granite Mill	Textile mill (1844)	(2017) TRC (2018)	Listed in NRHP	12/20/18 Listed in NRHP	Avoid or mitigate
AM1520 **a/** J.M. Jordan House	House (1915)	Briggs (2002) TRC (2018)	Unassessed	12/20/18 Assessment incomplete	More information is needed for evaluation
AM1522 **a/** G.L. Lewis Farmstead	House (1910)	Bakau et al, (2001) TRC (2018)	Not eligible	12/20/18 Not eligible	None

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
AM2407/2408 a/ Tabardrey Mill	Textile mill (1901)	(2005) TRC (2018)	Not eligible	12/20/18 Assessment incomplete	More information is needed for evaluation
AM2506 Ace Speedway	Automobile race track (1956)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2538	House (1939)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2539	House (1915)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2587	House (1961)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2588 Edwards Automotive Products and Childrey House WWII Home Front Museum	Commercial buildings (1947 & 1950)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2589	House (1917)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2590 R. Flynt Building	Commercial structure (1920)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2592	Commercial structure (1903)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2593	House (1924)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2594	House (1929)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2595	Warehouse (1968)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2597	Commercial structure (1903)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2598	Culvert (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2603 North Carolina Railroad	Two-sets active railroad tracks (1894)	TRC (2018)	Not eligible	12/20/18 Not eligible	None

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
AM2610	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2611	Commercial structure (1960)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2613	Commercial structure (1966)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2617	House (1973)	TRC (2019)	Not eligible	Unknown	None
AM2618	House (1973)	TRC (2019)	Not eligible	Unknown	None
AM2621	House (1935)	TRC (2019)	Not eligible	Unknown	None
AM2626	House (1971)	TRC (2019)	Not eligible	Unknown	None
AM2630	House (1971)	TRC (2019)	Not eligible	Unknown	None
AM2649	House (1940)	TRC (2019)	Not eligible	Unknown	None
AM2653	House (1936)	TRC (2019)	Not eligible	Unknown	None
Rockingham County					
RK1661	House (1947)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1664 Abandoned former bus station	Commercial structure (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1668	House (1960)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1676	Tobacco barn (1900)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1681	Tobacco barn (1920)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1682	Farmstead with house (1932)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1685	House (1930)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1689	Tobacco barn (1920)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1699	House (1947)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1702	Commercial structure (1932)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1708	House (1929)	TRC (2018)	Not eligible	12/20/18 Not eligible	None

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
RK1711	House (1950)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1800	House (1920)	TRC (2019)	Not eligible	Unknown	None
RK1801	House (1962)	TRC (2019)	Not eligible	Unknown	None
WITHIN YARDS AND STAGING AREAS					
Guilford County					
GF9115	Commercial (1960)	TRC (2019)	Not eligible	Unknown	None
GF9116 Norfolk Southern	Two sets active railroad tracks (1894/1939)	TRC (2019)	Not eligible	Unknown	None
Rockingham County					
RK1769 Norfolk Southern	Three active sets of railroad tracks (1894)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1770 First Baptist Church of Draper	Church (1962)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1802 Norfolk Southern	One set of active railroad tracks (1894)	TRC (2019)	Not eligible	Unknown	None
RK1804	Commercial (1973)	TRC (2019)	Not eligible	Unknown	None
RK1805	House (1927)	TRC (2019)	Not eligible	Unknown	None
RK1811	Commercial (1922)	TRC (2019)	Not eligible	Unknown	None
RK1812	House (1945)	TRC (2019)	Not eligible	Unknown	None
RK1813	House (1949)	TRC (2019)	Not eligible	Unknown	None
RK1816	House (1949)	TRC (2019)	Not eligible	Unknown	None
ALONG ACCESS ROADS					
Alamance County					
AM2527	House (1942)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2558	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2560	House (1957)	TRC (2018)	Not eligible	12/20/18 Not eligible	None

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
AM2561	House (1952)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2562	House (1956)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2563	House (1956)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2564	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2565	House (1957)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2566	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2567	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2568	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2569	House (1960)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2570	House (1958)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2571	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2572	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2573	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2574	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2575	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2576	House (1954)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2577	House (1958)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2578	House (1956)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2579	House (1950)	TRC (2018)	Not eligible	12/20/18 Not eligible	None

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
AM2580	House (1955)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2581	House (1958)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2582	House (1958)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2583	House (1958)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2586 Remnants and Textile Decorative Fabrics	Commercial structure (1956)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2602	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
AM2623	House (1955)	TRC (2019)	Not eligible	Unknown	None
AM2624	House (1969)	TRC (2019)	Not eligible	Unknown	None
AM2634	House (1960)	TRC (2019)	Not eligible	Unknown	None
AM2645	House (1930)	TRC (2019)	Not eligible	Unknown	None
AM2646	House (1963)	TRC (2019)	Not eligible	Unknown	None
AM2647	House (1950)	TRC (2019)	Not eligible	Unknown	None
AM2654	House (1972)	TRC (2019)	Not eligible	Unknown	None
Rockingham County					
RK1086 **a/** part of Willow Oak Plantation	Barn (ca. 1890)	Butler et al. (1975) TRC (2019)	Not eligible	Unknown	None
RK1396 **a/**	House (1900)	Edwards Pittman Environmental (2002) TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1672	Hunting cabin (1970)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1696	House (1962)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1704 American Tobacco Company plant	Commercial structure (1920)	TRC (2018)	Not eligible	12/20/18 Unevaluated	More information is needed for evaluation

TABLE 4.10-11

Historic Architectural Sites Identified by Mountain Valley in the Direct APE of the Southgate Project in North Carolina

Site Number (Name)	Type (Year Built)	Recorder (Year)	TRC Evaluation	SHPO Evaluation	Future Work
RK1707	House (1926)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1717	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1718	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1719	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1720	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1721	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1722	House (1940)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1738	Farmstead with house (1900)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1753	House (1967)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1768	House (1920)	TRC (2018)	Not eligible	12/20/18 Not eligible	None
RK1784	House (1946)	TRC (2019)	Not eligible	Unknown	None
RK1795	House (1971)	TRC (2019)	Not eligible	Unknown	None
RK1797	House (1965)	TRC (2019)	Not eligible	Unknown	None

a/ Previously recorded site

4.10.4 Unanticipated Discovery Plan

It is possible that during construction, there could be unanticipated discoveries of previously unknown and unidentified cultural resources or human remains. To account for that possibility, and provide for measures that could be implemented to reduce impacts and mitigate effects for those situations, Mountain Valley developed a Project-specific UDP for Virginia and North Carolina (filed as Appendix 4-C of RR 4 in its application to the FERC). The UDP was reviewed and approved by the SHPOs of Virginia and North Carolina (September 6 and 14, 2018, respectively),[37] and the Catawba Indian Tribe. On February 20, 2019, the Monacan Indian Nation filed with the FERC comments on the UDP (accession number 20190221-5108). We expect Mountain Valley to address the concerns of the Monacan Indian Nation.

4.10.5 Compliance with the National Historic Preservation Act

We have not yet completed the process of complying with the NHPA. Additional investigations and/or plans remain outstanding. As of May 7, 2019, about 6.5 miles of proposed pipeline route, and about 3.3 miles of access roads have still not yet been surveyed.

To resolve adverse effects at affected historic properties, the FERC will produce an agreement document (either a Memorandum of Agreement [MOA] or Programmatic Agreement [PA]) for the current undertaking, to be circulated among the consulting parties. The agreement document will also allow for additional phased surveys and testing investigations.

To ensure that the Commission's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Mountain Valley should <u>not begin</u> construction of facilities and/or use of all staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**

  a. Mountain Valley files with the Secretary:

    i. remaining cultural resources survey reports;

    ii. site evaluation reports and avoidance or treatment plans, as required; and

    iii. comments on the cultural resources reports and plans from the Virginia and North Carolina SHPOs and interested Indian tribes.

[37] The Virginia and North Carolina SHPOs approvals of the UDP were filed by Mountain Valley in its November 6, 2018 application. This information can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20181106-5159 in the "Numbers: Accession Number" field.

b. **The ACHP is afforded an opportunity to comment if historic properties would be adversely affected. and**

c. **The FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Mountain Valley in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.**

All materials filed with the Commission containing 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."

4.10.6 Cultural Resources Conclusions

We have not yet completed the process of complying with the NHPA. Additional cultural resources inventories and evaluations need to be completed. Consultations with the SHPOs and interested Indian tribes have also not been concluded. The Project would have no effect on sites determined to be not eligible for the NRHP. Should the Project be approved by the Commission, adverse effects on historic properties in the APE would be resolved through an agreement document. The agreement document would stipulate the implementation of treatment plans that would require data recovery excavations or other investigations at the affected historic properties. While excavations may be considered to have adverse impacts on historic properties, the recovery of data would mitigate those impacts to less than significant levels.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

This section of the draft EIS describes existing air quality; identifies the construction and operating air emissions; summarizes methods that would be used to achieve compliance with regulatory requirements; and outlines projected air quality impacts for the Project.

The Project would include construction and operation of 73.7 miles of natural gas transmission pipeline, one new natural gas-fired compressor station (i.e., the Lambert Compressor Station), and other associated aboveground ancillary facilities (pig launchers/receivers, mainline valves, and meter stations/interconnects) within Pittsylvania County, Virginia and Rockingham and Alamance Counties, North Carolina. Temporary air emissions would be generated during Project construction, which would occur over a 2-year period; long-term air emissions would be generated during Project operation, most of which would be associated with operation of the new compressor station. Construction and operational air emissions as well as proposed mitigation measures are discussed in section 4.11.1.3.

4.11.1.1 Regional Climate

Air quality is substantially influenced by climate and meteorological conditions; therefore, prevalent weather patterns are a major factor in both short- and long-term air quality conditions. The south-central area of Virginia and the northcentral area of North Carolina have a humid subtropical climate. The winters are temperate and the summers long and hot.

Based on 1981 to 2010 climate data from the National Center for Environmental Information (NCEI), temperatures at the Chatham meteorological station in Pittsylvania County range from a monthly minimum average of 22.8 °F in January to a maximum average of 86.3 °F in July. Mean annual precipitation is 45.2 inches, while monthly average precipitation ranges from a minimum of 3.0 inches in February to a maximum of 4.5 inches in July. Mean annual snowfall is 4 inches, and average annual wind speed is 7.4 miles per hour with a prevailing wind direction from the west-southwest. At the Reidsville 2 NW meteorological station in Rockingham County, temperatures range from a monthly minimum average of 28.0 °F in January to a maximum average of 87.6 °F in July. Mean annual precipitation is 46.4 inches, while monthly average precipitation ranges from a minimum of 3.3 inches in December to a maximum of 4.8 inches in July. Mean annual snowfall is 9 inches, and average annual wind speed is 7.1 miles per hour with a prevailing wind direction from the southwest (NCEI, 2018).

4.11.1.2 Ambient Air Quality Standards

Ambient air quality is protected by federal and state regulations. With authority granted by the CAA 42 U.S.C. 7401 et seq. as amended in 1977 and 1990, the EPA established NAAQS to protect human health (primary standards) and public welfare (secondary standards). The EPA codified NAAQS in 40 CFR 50 for the following “criteria pollutants:” nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), SO_2, lead (Pb), particulate matter (PM) with an aerodynamic diameter equal to or less than 10 microns (PM_{10}), and PM with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$). These NAAQS reflect the relationship between pollutant concentrations and health and welfare effects. The NAAQS are summarized in table 4.11-1.

TABLE 4.11-1

National Ambient Air Quality Standards

Pollutant	Timeframe	Primary	Secondary	Form
PM_{10}	24-hour	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	Annual mean, averaged over 3 years
	24-hour	35 µg/m^3	35 µg/m^3	98th percentile, averaged over 3 years
SO_2	3-hour	NA	0.5 ppm	Not to be exceeded more than once per year
	1-hour	75 ppb	NA	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
CO	8-hour	9 ppm	NA	Not to be exceeded more than once per year
	1-hour	35 ppm	NA	Not to be exceeded more than once per year
NO_2	Annual	53 ppb	53 ppb	Annual mean
	1-hour	100 ppb	NA	98th percentile of 1-hour daily maximum concentration, averaged over 3 years
O_3	8-hour	0.070 ppm	0.070 ppm	Annual 4th highest daily maximum 8-hour concentration, averaged over 3 years
Pb	3-month rolling	0.15 µg/m^3	0.15 µg/m^3	Not to be exceeded

Source: EPA, 2016

Abbreviations:

NA = not applicable
ppb = part(s) per billion
µg = microgram(s)
ppm = part(s) per million

While states can promulgate more stringent standards than the NAAQS, the VADEQ has adopted the NAAQS in Title 9 of the Virginia Administrative Code (9VAC), Agency 5, Chapter 30; and the NCDEQ has adopted the NAAQS in Title 15A of North Carolina Administrative Code (15A NCAC), Subchapter 02D, Section 0400. Additional pollutants, such as volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) would also be emitted during construction and operation. These pollutants are regulated through various components of the CAA.

4.11.1.3 Air Quality Control Regions and Attainment Status

The EPA has established Air Quality Control Regions (AQCR) in accordance with Section 107 of the CAA. AQCRs are defined as contiguous areas considered to have relatively uniform ambient air quality, and are treated as single geographical units for reducing emissions and determining compliance with the NAAQS. Areas where ambient air pollutant concentrations are below the NAAQS are designated as “attainment,” while areas where ambient air concentrations are above the NAAQS are designated as “nonattainment.” Areas previously designated as nonattainment that have subsequently demonstrated compliance with the NAAQS are designated as “maintenance” for a period of time (normally 20 years after the effective date of attainment);

this time period assumes that the area remains in compliance with the standard. Areas that lack sufficient data to determine their designation are designated "unclassifiable," and are treated as attainment areas for the purpose of stationary source air permitting.

The Project would be constructed in Pittsylvania County, Virginia within the Central Virginia Intrastate AQCR and Rockingham and Alamance Counties, North Carolina within the Northern Piedmont Intrastate AQCR. Areas intersected by the Project are designated as attainment or unclassifiable for the criteria pollutants (EPA, 2018b; EPA, 2018c).

There are three attainment air quality classifications within each of the AQCRs of the United States. Class I areas are designated as pristine natural areas or areas of natural significance and receive special protections under the CAA based on good air quality. Class III areas are heavily-industrialized zones that are established only on request and must meet all requirements outlined in 40 CFR 51.166. The remainder of the United States is designated as Class II. If a new source or major modification of an existing source is subject to the Prevention of Significant Deterioration (PSD) program requirements and is within 62 miles (100 kilometers [km]) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area.

The closest designated Class I areas to the Project's Lambert Compressor Station are the James River Face Wilderness Area about 50 miles (81 km) from the proposed site and the Shenandoah National Park about 89 miles (143 km) from the proposed site. However, emissions from the compressor station would not trigger a PSD review (see section 4.11.1.5), and therefore a Class I impact analysis would not be required.

4.11.1.4 Air Quality Monitoring and Existing Air Quality

Along with state and local agencies, the EPA created a network of ambient air quality monitoring stations that collect data on background concentrations of criteria pollutants across the United States. To characterize the existing ambient air quality for the Project, data were gathered from the closest monitoring stations to the Lambert Compressor Station in Pittsylvania County, Virginia:

- For NO_2, CO, $PM_{2.5}$, and SO_2, the closest monitoring site is in Vinton (Roanoke County, Virginia), about 43 miles (69 km) from the site (Site ID 51-161-1004);
- For PM_{10} and O_3, the closest site is in Reidsville (Caswell County, North Carolina) about 37 miles (59 km) from the site (Site ID 37-033-0001); and
- For Pb, the closest monitoring site is in Roanoke City (Roanoke County, Virginia), about 50 miles (80 km) from the site (Site ID 51-161-1004).

Table 4.11-2 shows monitoring data for criteria pollutants for 2016 and 2017 from the monitoring sites, along with the appropriate primary NAAQS standard. All monitored values were below the NAAQS.

TABLE 4.11-2

Baseline Ambient Air Quality

Pollutant	Time Period	Description of Monitored Value	2016	2017	Primary NAAQS
PM_{10}	24-hour	2nd high	38.0 μg/m^3	23.0 μg/m^3	150 μg/m^3
$PM_{2.5}$	Annual	Arithmetic mean	6.7 μg/m^3	6.6 μg/m^3	12 μg/m^3
	24-hour	98th percentile	15.0 μg/m^3	14.0 μg/m^3	35 μg/m^3
SO_2	1-hour	99th percentile	4.0 ppb	3.0 ppb	75 ppb
CO	8-hour	2nd high	0.7 ppm	0.7 ppm	9 ppm
	1-hour	2nd high	1.1 ppm	1.0 ppm	35 ppm
NO_2	Annual	Arithmetic mean	5.7 ppb	5.2 ppb	53 ppb
	1-hour	98th percentile	37.0 ppb	32.0 ppb	100 ppb
O_3	8-hour	4th high	0.064 ppm	0.059 ppm	0.070 ppm
Pb	3-month rolling	1st high	0.01 μg/m^3	0.02 μg/m^3	0.15 μg/m^3

Source: EPA, 2018d

4.11.1.5 Air Quality Regulatory Requirements

New Source Review/Prevention of Significant Deterioration

Federal pre-construction review of certain large proposed projects varies for attainment and nonattainment areas. Federal pre-construction review for sources in nonattainment areas is referred to as Nonattainment New Source Review, while federal pre-construction review for sources in attainment areas is formally referred to as PSD. The review process aids in preventing new sources and modifications to existing systems from causing existing air quality to deteriorate beyond acceptable levels.

A new source in attainment area is classified as PSD major if it has the potential-to-emit (PTE) more than 100 tons per year (tpy) of a pollutant regulated under the CAA and it is listed in one of the 28 named source categories in Section 169 of the CAA, or if it has the PTE more than 250 tpy and is not listed in one of the 28 named source categories in Section 169 of the CAA[38]. For a source that is major for at least one regulated pollutant (i.e., is subject to PSD review), all pollutants that are emitted in amounts equal to or greater than the significant emission rates are also subject to PSD review (i.e., 40 tpy NOx, 100 tpy CO, 40 tpy SO_2, 15 tpy PM_{10}, 10 tpy $PM_{2.5}$, 40 tpy VOCs, or 75,000 tpy GHGs in units of carbon dioxide equivalents (CO_2e)).

Table 4.11-3 summarizes the PTE from operation of the Project's Lambert Compressor Station. Potential emissions assume 52 start-up/shutdown events per year per combustion turbine (10 minute event duration). Furthermore, both combustion turbine would be equipped with Solar's Advanced SoloNOx combustor technology for NOx emissions control. Potential emissions

38 This summary reflects July 24, 2014 EPA Memorandum indicating that the EPA will no longer treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit (EPA, 2014).

include fugitives from incidental leaks or releases from valves, connectors, flanges, and seals, as well as emissions from two types of gas blowdown events that could occur at the compressor station: (1) maintenance gas blowdowns that occur when a compressor is stopped and gas between the suction/discharge valves and compressors is vented to the atmosphere; and (2) emergency full station shutdown (ESD) blowdowns that would only occur infrequently at required DOT test intervals or in an emergency situation. Potential emissions assume 16 blowdown events per year, although only 8 are expected for system testing and maintenance.

The natural gas compressor station is a non-listed source category and would be located in an attainment/unclassifiable area for all criteria pollutants. Consequently, because emissions are less than 250 tpy, the Lambert Compressor Station would not be subject to PSD review.

TABLE 4.11-3

Potential-to-Emit for the Lambert Compressor Station

	Annual Pollutant Emissions (tpy)							
Emission Unit	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOCs**	**HAPs**	**GHGs**
Solar Taurus Turbine (11,792 hp)	13.2	17.3	2.1	4.0	4.0	2.2	1.6	47,063
Solar Mars Turbine (17,123 hp)	19.6	36.3	3.1	6.0	6.0	4.0	2.6	69,982
Capstone Micro-turbines (5 Units; 200 kW each)	1.8	4.8	0.2	0.3	0.3	0.4	0.2	5,847
Fuel Gas Heater (0.77 MMBtu/hr)	0.3	0.3	0.0	0.0	0.0	0.0	0.0	395
Produced Fluids Tanks (2 Units; 10,000 gallon each)	--	--	--	--	--	0.4	0.0	4
Blowdowns	--	--	--	--	--	0.6	0.0	1,411
Fugitives	--	--	--	--	--	0.8	0.0	1,740
TOTAL	**34.9**	**58.6**	**5.4**	**10.4**	**10.4**	**8.4**	**4.5 a/**	**126,442**

a/ The highest individual HAP is formaldehyde with emissions of 3.5 tpy.

Abbreviations:

-- = no associated emission
kW = kilowatts
hp = horsepower
MMBtu/hr = million British thermal units per hour

New Source Performance Standards

The New Source Performance Standards (NSPS), codified in 40 CFR 60, regulate emission rates and provide requirements for new or significantly modified sources. NSPS requirements include emission limits, monitoring, reporting, and record keeping. Applicable NSPS for the Project, based on the types of emission units and the expected date of installation, would potentially include, but not be limited to, the subparts listed below.

- 40 CFR 60 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 60.

- 40 CFR Subpart KKKK – Standards of Performance for Stationary Combustion Turbines. This subpart applies to stationary combustion turbines that commenced construction, modification, or reconstruction after February 18, 2005 and have a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 MMBtu/hr [million British thermal units per hour]). The proposed Solar turbines at the Lambert Compressor Station would be subject to NSPS Subpart KKKK as their fuel heat input ratings would exceed 10 MMBtu/hr, and their manufacturing date would be after February 18, 2005. Subpart KKKK regulates emissions of NOx and SO_2. The turbines would be subject to a NOx emission limit of 25 parts per million (ppm) at 15 percent oxygen. The SO_2 requirement would be met through exclusive use of natural gas fuel with sulfur content at or below 0.060 pound of SO_2 per MMBtu. Mountain Valley would comply with all applicable Subpart KKKK standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR 60 Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution. This subpart establishes standards for GHGs (in the form of limitations on methane [CH_4]), VOCs, and SO_2 from affected facilities that commenced construction, modification, or reconstruction after September 18, 2015. Affected facilities include centrifugal compressors, reciprocating compressors, pneumatic controllers, pneumatic pumps, storage vessels, and equipment leaks and sweetening units within the crude oil and natural gas sector. Fugitive emissions components at the Lambert Compressor Station would be subject to Subpart OOOOa. Mountain Valley would comply with all applicable leak detection and repair requirements of Subpart OOOOa, including the use of optical gas imaging (OGI) technology during its periodic surveys.

National Emissions Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAPs), codified in 40 CFR 61 and 63, regulate the emissions of HAPs from new and existing sources. Part 61, promulgated before the 1990 CAA Amendments, regulates eight hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology (MACT) standards. Part 63 regulates HAPs from major sources of HAPs and specific source categories emitting HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs.

Potential HAP emissions from the Lambert Compressor Station would be below the major source thresholds. Consequently, it would be considered an area source of HAP emissions. However, there would be no applicable NESHAPs based on the types of emission units and the expected date of installation.

Title V Operating Permit

The required elements of Title V operating permit programs are outlined in 40 CFR 70 and 40 CFR 71. Title V operating permits may be referred to as “Part 70” or “Part 71” permits, or as

Title V permits. A Title V permit should list all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. Regulations also require that the permittee annually report the compliance status of its source with respect to permit conditions to the corresponding regulatory agency.

A Title V major source, as defined in 40 CFR 70.2, is a source or group of stationary sources (including new and existing sources) within a contiguous area and under common control, emitting or with the PTE of regulated pollutants or HAPs above threshold values. The Title V major source threshold is 100 tpy of CO, NOx, SO_2, VOC, PM_{10}, or $PM_{2.5}$; 10 tpy for any single HAP, and 25 tpy for any combination of HAPs.

Potential emissions from the Lambert Compressor Station would be below the Title V major source thresholds (see table 4.11-3). Consequently, a Title V operating permit would not be required.

General Conformity

The General Conformity Rule was designed to require federal agencies to ensure that federally-funded or federally-approved projects conform to the applicable State Implementation Plan (SIP). Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of NAAQS. General Conformity regulations apply to project-wide direct and indirect emissions of pollutants (and all precursors) for which the project areas are designated as nonattainment or maintenance that are not subject to New Source Review (NSR) and that are greater than the significance thresholds established in the General Conformity regulations or 10 percent of the total emissions budget for the entire nonattainment or maintenance area. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- emissions from the project that are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- emissions from the action that are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so there is no net increase in emissions of that pollutant.

The Project would be entirely within an attainment/unclassifiable area; consequently, it is not subject to General Conformity.

GHG Reporting Rule

The Mandatory Reporting of Greenhouse Gases Rule requires reporting of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHGs (reported as CO_2e), which equates to 27,558 tpy. Onshore natural gas transmission compression facilities are considered part of the source category regulated by 40 CFR Part 98, Subpart W.

Potential GHG emissions from the Lambert Compressor Station would be greater than 25,000 metric tpy (see table 4.11-3). However, the rule establishes reporting requirements based on actual emissions. Mountain Valley would monitor emissions in accordance with the reporting rule. If actual emissions exceed the 25,000 metric tpy threshold, GHG emissions would be reported to the EPA as required.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources, including CH_4, propane, and ethylene in amounts greater than 10,000 pounds. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than that specified in the regulation, the facility must prepare and submit a risk management plan (RMP). An RMP is not required to be submitted to the EPA until the chemicals are stored on-site at the facility.

If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility is not required to prepare a RMP. In the latter case, the facility still must comply with the requirements of the general duty provisions in Section 112(r)(1) of the 1990 CAA Amendments if there is any regulated substance or other extremely hazardous substance on-site. The general duty provision is as follows: "The owners and operators of stationary sources producing, processing, handling and storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility, taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

Chemicals regulated by this rule, including CH_4 and ethane, would be produced, processed, handled, or stored at the new compressor station. However, natural gas transmission facilities are not subject to the RMP regulations if they are subject to DOT requirements or to a state natural gas program certified by the DOT. As such, the Project would not be subject to the RMP regulations.

4.11.1.6 State Air Quality Regulations

Project activities undertaken within the state of Virginia would involve temporary construction, installation of pipelines, and operation of the Lambert Compressor Station. The applicable state air quality regulations, codified in 9VAC5, are listed below:

- 9VAC5-20 – General Provisions
- 9VAC5-30 – Ambient Air Quality Standards
- 9VAC5-50 – New and Modified Stationary Sources
- 9VAC5-50-80 – Standard for Visible Emissions
- 9VAC5-50-90 – Standard for Fugitive Dust/Emissions

- 9VAC5-50-260 – Best Available Control Technology (BACT)
- 9VAC5-60 – Hazardous Air Pollutant Sources
- 9VAC5-80 – Permits for Stationary Sources
- 9VAC5-80-1100 – Permits for New and Modified Stationary Sources
- 9VAC5-130 – Open Burning

Project activities undertaken within the state of North Carolina would involve temporary construction and installation of pipelines. The applicable state air quality regulations, codified in 15A NCAC 02D, would include 15A NCAC 02D.1900 to control air pollution resulting from the open burning. Mountain Valley has committed to comply with all applicable state requirements.

4.11.1.7 Air Emission Impacts and Mitigation

Construction Air Impacts and Mitigation

Air quality impacts associated with construction of the Project would include emissions from fossil fuel-fired construction equipment, deliveries, and worker commutes; fugitive dust from ground disturbance and transportation; and emissions associated with burning wood debris in construction work areas.

Fossil fuel-fired construction equipment, trucks, and delivery vehicles are a source of combustion emissions, including NOx, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, and small amounts of HAPs. Construction equipment, trucks, and delivery vehicles would also emit GHGs. Gasoline and diesel engines must comply with the EPA mobile source regulations in Title 40 CFR Part 85 for on-road engines and Title 40 CFR Part 89 for non-road engines. These regulations are designed to minimize emissions and require a maximum sulfur content in diesel fuel of 15 parts per million (ppm). Mountain Valley has identified additional mitigation measures to minimize construction combustion emissions, including using newer model equipment that are equipped with the latest emissions reduction technologies when practical; following manufacturer's operating recommendations regarding good combustion practices; and avoiding idling of the construction equipment to the extent possible.

Fugitive dust is a source of respirable airborne PM, including PM_{10} and $PM_{2.5}$, which could result from land clearing, grading, excavation, and mobile source traffic on paved and unpaved roads. The amount of dust generated is a function of construction activity, silt and moisture content of the soil, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. During construction of the Lambert Compressor Station, Mountain Valley would comply with Virginia regulations requiring measures to prevent fugitive dust from becoming airborne and leaving the property boundary of an affected facility (9VAC5-50-90).

During construction, Mountain Valley would implement the following mitigation measures to minimize the generation of dust: minimizing disturbed areas as much as possible through construction sequencing; using wet suppression to control dust from motorized equipment and vehicle traffic; utilizing water trucks, power washers, sweepers, and/or vacuums on paved roads to control dust; and placing rock construction entrances on access roads that begin at a junction with paved roads to reduce track out of loose materials. Mountain Valley would also conduct daily inspections of dust control measures when environmental conditions are dry.

Ground-level open burning emissions are affected by many variables, including wind, ambient temperature, composition and moisture content of the debris burned, and compactness of the pile. In general, the relatively low temperatures associated with open burning increase emissions of NOx, CO, VOCs, PM_{10}, and $PM_{2.5}$. Mountain Valley may utilize open burning as a means of disposing of land clearing waste during construction of the Project. Any open burning would be conducted on a site-specific basis, and in accordance Mountain Valley's *Fire Prevention and Suppression Plan* and Virginia and North Carolina regulations (9VAC5-130; 15A NCAC 02D.1900). This would include burning only in approved burn areas and during appropriate weather conditions to avoid any impacts on nearby residences, and complying with the open burning prohibition in Virginia from May 1 through September 30.

Estimated construction emissions for the Project for years 2020 and 2021 are shown in table 4.11-4. Emissions would not typically be concentrated in any one location, but would occur incrementally along the pipeline route. Construction of the compressor station and aboveground ancillary facilities may occur at a single location for a longer duration. However, this activity is temporary. Once the Project's construction phase is completed, fugitive dust and construction emissions would subside; thus, the length of time the area would be exposed to dust and emissions from construction activities would be limited. Consequently, air emissions from construction would result in localized, intermittent, and temporary impacts and would not be expected to impact regional air quality or result in any violation of applicable ambient air quality standards. As a result, we conclude the impacts on local air quality during construction of the Project would not be significant.

TABLE 4.11-4

Estimated Construction Emissions for the Southgate Project

	Annual Pollutant Emissions (tons), by Year							
Emission Source a/	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**VOCs**	**HAPs**	**GHGs b/**
Year 2020 Construction Emissions								
Lambert Compressor Station/Interconnect								
Commuter transit	0.5	3.8	0.0	0.1	0.0	0.1	0.1	470
Construction equipment	26.0	21.0	0.1	2.1	1.8	3.6	0.3	9,430
Open burning	0.1	2.9	0.0	0.4	0.4	0.5	0.0	65
Fugitive dust	--	--	--	34.9	4.2	--	--	--
Subtotal	**26.6**	**27.7**	**0.1**	**37.4**	**6.4**	**4.3**	**0.3**	**9.965**
Meter Stations								
Commuter transit	0.1	1.3	0.0	0.0	0.0	0.0	0.0	150
Construction equipment	17.5	12.1	0.0	1.4	1.2	2.2	0.2	6,266
Open burning	0.0	0.2	0.0	0.0	0.0	0.0	0.0	4
Fugitive dust	--	--	--	21.3	2.6	--	--	--

TABLE 4.11-4

Estimated Construction Emissions for the Southgate Project

Emission Source a/	Annual Pollutant Emissions (tons), by Year NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOCs	HAPs	GHGs b/
Subtotal	**17.6**	**13.6**	**0.0**	**22.7**	**2.6**	**2.3**	**0.2**	**6,420**
Pipeline								
Commuter transit	2.1	25.2	0.0	0.5	0.1	0.8	0.3	2,822
Construction equipment	199.4	78.5	0.4	11.6	11.4	25.2	2.0	85,050
Open burning	11.1	387.6	0.0	47.1	47.1	66.5	0.0	8,805
Fugitive dust	--	--	--	1,098.1	118.2	--	--	--
Subtotal	**212.5**	**491.3**	**0.5**	**1,157.3**	**176.8**	**92.4**	**2.4**	**96,677**
Year 2020 Total	**256.7**	**532.6**	**0.6**	**1,217.4**	**187.0**	**98.9**	**2.9**	**113,062**
Year 2021 Construction Emissions								
Lambert Compressor Station/Interconnect								
Commuter transit	0.1	0.7	0.0	0.0	0.0	0.0	0.0	95
Construction equipment	5.0	3.0	0.0	0.4	0.4	0.8	0.1	2,162
Open burning	--	--	--	--	--	--	--	--
Fugitive dust	--	--	--	10.0	1.1	--	--	--
Subtotal	**5.1**	**3.6**	**0.0**	**10.4**	**1.5**	**0.8**	**0.1**	**2,257**
Pipeline								
Commuter transit	0.4	1.8	0.0	0.1	0.0	0.1	0.0	292
Construction equipment	6.2	2.8	0.0	0.4	0.3	1.2	0.1	4,548
Open burning	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Fugitive dust	0.0	0.0	0.0	626.5	66.7	0.0	0.0	0
Subtotal	**6.6**	**4.6**	**0.0**	**626.9**	**67.1**	**1.3**	**0.1**	**4,840**
Year 2021 Total	**11.7**	**8.2**	**0.0**	**637.3**	**68.6**	**2.1**	**0.2**	**7,097**

a/ Emission sources for each Project component are sorted by type of construction activity, as follows: Commuter transit include tailpipe emissions from vehicle travel; Construction equipment include tailpipe emissions from heavy equipment; Open burning includes fugitives from burning of brush and slash from clearing; and Fugitive dust includes dust from earthmoving fugitives, travel on paved and unpaved roads, and wind erosion.

b/ GHGs include CO_2 emissions only.

Operations Air Impacts and Mitigation

Operation of the Project would result in emissions from the Lambert Compressor Station, as well as emissions from maintenance and testing blowdowns and incidental leaks from pipeline and four interconnects. Estimated operational emissions are shown in table 4.11-5.

TABLE 4.11-5

Estimated Operational Emissions for the Southgate Project

Emission Source	Annual Pollutant Emissions (tons per year)							
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOCs	HAPs	GHGs
Lambert Compressor Station a/	34.9	58.6	5.4	10.4	10.4	8.4	4.5	126,442
Blowdowns	--	--	--	--	--	4.2	0.2	4,193
Fugitives	--	--	--	--	--	0.2	0.0	155
Total	**34.9**	**58.6**	**5.4**	**10.4**	**10.4**	**12.8**	**4.7**	**130,790**

a/ See table 4.11-3 for detailed information on emissions from each type of emission source for the compressor station.

Minor NSR permits are required for facilities that emit less than 100 tpy of any criteria pollutant (PM, PM_{10}, $PM_{2.5}$, CO, NOx, SO_2, and VOC) but more than the criteria pollutant exemption levels listed in 9VAC5-80-1105C (i.e., 40 tpy NOx, 100 tpy CO, 40 tpy SO_2, 15 tpy PM_{10}, 10 tpy $PM_{2.5}$, or 25 tpy VOCs). Minor NSR permits are also required for facilities that emit HAPs more than state toxic exemption levels listed in 9VAC5-60-300C and 9VAC5-80-1105E but less than 10 tpy of one HAPs or 25 tpy of a combination of HAPs. Operation of the Lambert Compressor Station would trigger air permitting as a minor source of air emissions, specifically as a result of emissions of $PM_{2.5}$ and formaldehyde. NOx emissions would not trigger minor permitting due to installation of Solar's Advanced SoloNOx combustor technology on both combustion turbines. Mountain Valley submitted an air permit application to VADEQ in November 2018 with a revision in April 2019, which is pending review and issuance. Compliance with the applicable federal and state air quality standards and regulations would be addressed accordingly in the air quality permit. As a result, air quality impacts during operation of the compressor station would be minor.

Pursuant to 9VAC5-50-260B, minor sources in Virginia are required to undergo a BACT review for each pollutant greater than the levels in 9VAC5-80-1105C. For the proposed Lambert Compressor Station, BACT would be required for $PM_{2.5}$. The air permit application included a BACT assessment and Mountain Valley proposed the following:

- **$PM_{2.5}$ BACT for Solar Turbines.** For controlling emissions of $PM_{2.5}$, Mountain Valley proposed the use of clean-burning fuels and good combustion practices as BACT. The turbines would be equipped with self-cleaning inlet air filters to reduce the entrainment of PM into the turbine and to reduce the PM exhaust emissions. Mountain Valley would develop and implement an *Operation and Maintenance Plan* to ensure good combustion practices.

Furthermore, based on review of EPA's voluntary Natural Gas Star program, Mountain Valley has identified the following as feasible mitigation measures for potential emission reduction measures:

- replace gas starters with air or nitrogen;

- reduce natural gas venting with fewer compressor engine startups and improved engine ignition;
- test and repair pressure safety valves;
- eliminate unnecessary equipment and/or systems;
- install automated air/fuel ratio controls;
- install electric motor starters; and
- reduce emissions when taking compressors off-line.

Mountain Valley conducted air dispersion modeling of the Lambert Compressor Station to demonstrate compliance with the NAAQS using EPA's model AERMOD (version 18081). A summary of the modeling results are provided in table 4.11-6. Results indicate that the maximum modeled concentrations when combined with background concentrations would be less than the applicable NAAQS for all criteria pollutants. The NO_2 results are predicted to be 12 percent of the annual standard and 50 percent of the one-hour standard. Mountain Valley expects to submit revised modeling results to VADEQ in July 2019 to support updates in the April 2019 revised application.

TABLE 4.11-6

Criteria Pollutant Modeling Results for Lambert Compressor Station

Pollutant	Timeframe	Maximum Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$) a/	NAAQS ($\mu g/m^3$)
PM_{10}	24-hour	7.4	35.0	42.4	150
$PM_{2.5}$	Annual	0.2	7.0	7.2	12
	24-hour	3.3 b/	15.7	19.0	35
SO_2	3-hour	3.7	10.5	14.2	1,300
	1-hour	4.1	10.5	14.6	196
CO	8-hour	54.0	805.0	859.0	10,000
	1-hour	59.1	1,265.0	1,324.1	40,000
NO_2	Annual	0.9 c/	10.7	11.6	100
	1-hour	31.5 c/	62.6	94.1	188

a/ Total concentration is the sum of the modeled and background concentration; this value is compared with the NAAQS.
b/ Based on maximum 98th percentile daily maximum modeled concentrations.
c/ Based on EPA's Ambient Ratio Method 2 (ARM2) modeling guidance.

Because emissions of formaldehyde at the compressor station would be greater than the exemption threshold in 9VAC5-60-300C, Mountain Valley also conducted air dispersion modeling of formaldehyde emissions. Results were compared with the VADEQ's Significant Ambient Air Concentration (SAAC) for formaldehyde, which is the concentration of the pollutant in ambient air that, if exceeded, may have an adverse effect to human health. As shown in table 4.11-7, results indicate that the maximum modeled concentrations would be less than the formaldehyde SAAC. Mountain Valley expects to submit revised modeling results to VADEQ in July 2019 to support updates in the April 2019 revised application.

TABLE 4.11-7

Formaldehyde Modeling Results for Lambert Compressor Station

Pollutant	Timeframe	Maximum Modeled Concentration (μg/m³)	Significant Ambient Air Concentration (μg/m³)
Formaldehyde	Annual	0.1	2.4
	1-hour	2.1	62.5

4.11.1.8 Conclusions Regarding Air Quality

Because pipeline construction moves through an area relatively quickly, air emissions are typically localized, intermittent, and temporary. Once construction activities in an area are completed, fugitive dust and construction equipment emissions would subside and the impact on air quality would diminish. Further, construction emissions would be minimized by mitigation measures described above. As a result, we conclude that the Project's construction-related impacts are not expected to result in a significant impact on local or regional air quality, although residents near the pipeline right-of-way, compressor station, and other associated aboveground ancillary facilities may experience intermittent elevated levels of fugitive dust and smoke-dust from nearby open burning.

Operational emissions would be a result of emissions from the Lambert Compressor Station, as well as minimal emissions from maintenance blowdowns and incidental leaks from the pipeline and four interconnects. The Lambert Compressor Station would be considered a minor source of air pollution according to Virginia regulations. Using advanced low NOx turbine combustors, clean-burning fuels, and self-cleaning turbine inlet air filters, low emission levels would be achieved with normal engine operation and good maintenance practices. Air quality dispersion modeling confirmed that emissions due to the compressor station's operations would not exceed the NAAQS or the formaldehyde SAAC. Therefore, emissions resulting from operation would not have significant impacts on local or regional air quality.

4.11.2 Noise

The existing noise environment would be affected by construction and operation of the Project. Temporary noise would be generated during Project construction, and long-term noise would be generated during operation. Construction and operational noise impacts as well as proposed mitigation measures are discussed in section 4.11.2.3.

4.11.2.1 Noise Levels and Terminology

Sound is mechanical energy transmitted by pressure waves in media such as air or water (FTA, 2006). When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Noise levels are quantified using decibels (dB), which are units of sound pressure. Noise may be continuous (constant noise with a steady decibel level), steady (constant noise with a fluctuating decibel level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (at intervals of high and low sound levels), or transient (occurring at different rates).

The A-weighted sound level, expressed as dBA, is an expression of the relative loudness of sounds in air as perceived by the human ear. Therefore, A-weighted sound levels are usually used to quantify audible sound and its effect on people (EPA, 1978). On the dBA scale, normal conversation falls at about 60 to 65 dBA, and sleep disturbance occurs at about 40 to 45 dBA. Table 4.11-8 contains examples of common activities and their associated noise levels in dBA.

TABLE 4.11-8

Typical Noise Levels for Common Activities

Activity	Noise Level (dBA)
Rock band	110
Gas lawnmower at 3 feet	95
Diesel truck at 50 feet at 50 miles per hour	85
Vacuum cleaner at 10 feet	70
Normal speech at 3 feet	65
Heavy traffic at 300 feet	60
Dishwasher in next room	50
Large conference room (background)	40
Bedroom at night	25
Broadcast/recording studio	15
Source: Caltrans, 2013	

Existing ambient noise levels, or background noise levels, are the current sounds from natural and artificial sources at the receptors. The magnitude and frequency of background noise at any given location may vary considerably over the course of a day or night and throughout the year. The variations are caused in part by weather conditions, seasonal vegetative cover, and human activity. Two common measures used to relate the time-varying quality of environmental noise levels to known effects on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total energy as the time-varying sound, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 dBA added to the nighttime sound levels between the hours of 10:00 p.m. and 7:00 a.m. to account for people's tendency to be more sensitive to sound during nighttime hours.

The potential for noise impacts are assessed by evaluating noise levels at the nearest noise sensitive areas (NSAs) such as residences, schools and day-care facilities, hospitals, long-term care facilities, places of worship, and libraries. Where the nature of a new sound is similar to the ambient noise level, an increase of 3 dBA is barely detectable by the human ear and an increase of 5 dBA is considered clearly noticeable. Increases of 10 dBA are perceived as a doubling of noise (i.e., twice as loud). Furthermore, noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography blocks the line of sight between the source and receptor.

Existing Sound Levels and Noise Sensitive Areas

Mountain Valley conducted baseline noise surveys at the nearest NSAs to the proposed Lambert Compressor Station and meter stations (referred to as interconnects) in July 2018. Figures 4.11-1 through 4.11-4 show the proximity and direction of the NSAs to the respective facility. Noise survey results are summarized in table 4.11-9, and indicate that existing ambient background noise levels range from 44.8 to 65.0 dBA L_{dn}. The existing land uses on and adjacent to these locations include upland forest/woodland, agricultural land, upland open land, and commercial/industrial land.

TABLE 4.11-9

Summary of Existing Ambient Noise Levels at the Southgate Project Aboveground Facilities

Facility/ NSA	NSA Land Use	NSA Distance and Direction from Facility	Ambient Noise Levels (dBA) a/ b/		Ambient Noise Level, L_{dn} (dBA)
			Daytime, L_d	Nightime, L_n	
Lambert Compressor Station/Interconnect (MP 0.0)					
NSA 1	Residential	3,480 feet WSW	36.8	40.8	46.8
NSA 2	Residential	3,500 feet SW	36.8	40.8	46.8
NSA 3	Residential	3,290 feet SE	60.4	55.1	62.8
NSA 4	Residential	3,800 feet N	38.6	38.4	44.8
LN 3600 Interconnect (MP 28.2)					
NSA 1	Residential	1,700 feet NNW	47.2	42.1	49.7
T-15 Dan River Interconnect (MP 30.4)					
NSA 1	Residential	750 feet S	63.1	57.1	65.0
T-21 Haw River Interconnect (MP 73.1)					
NSA 1	Residential	550 feet N	62.8	57.2	65.0

a/ Ambient noise surveys were conducted at each location for 24-hours.
b/ Insect noise was removed by omitting sound energy in the whole octave bands above 1,000 hertz.
Abbreviations:
L_d = daytime equivalent sound level
L_n = nighttime equivalent sound level

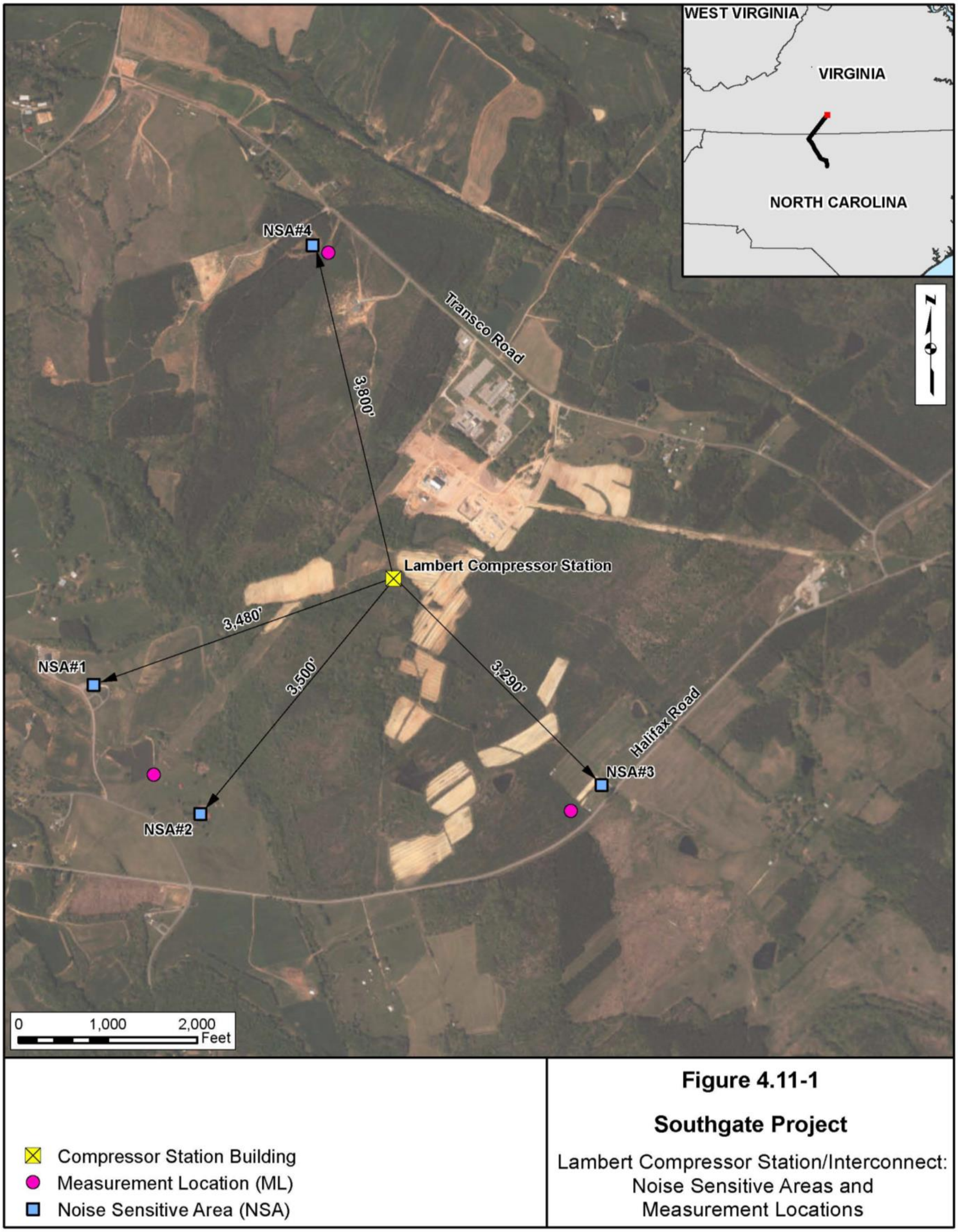


Figure 4.11-1

Southgate Project

Lambert Compressor Station/Interconnect: Noise Sensitive Areas and Measurement Locations

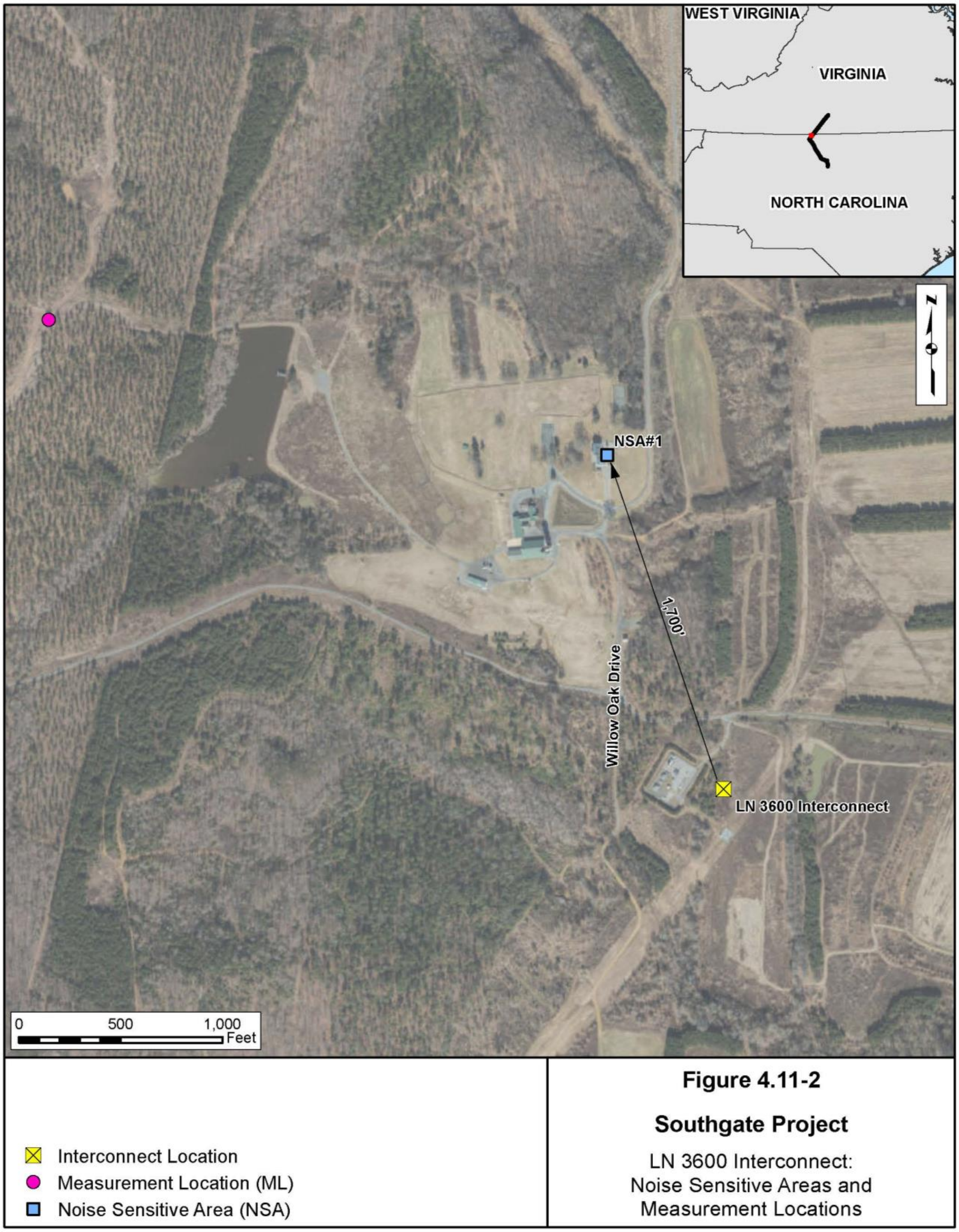


Figure 4.11-2

Southgate Project

LN 3600 Interconnect:
Noise Sensitive Areas and
Measurement Locations

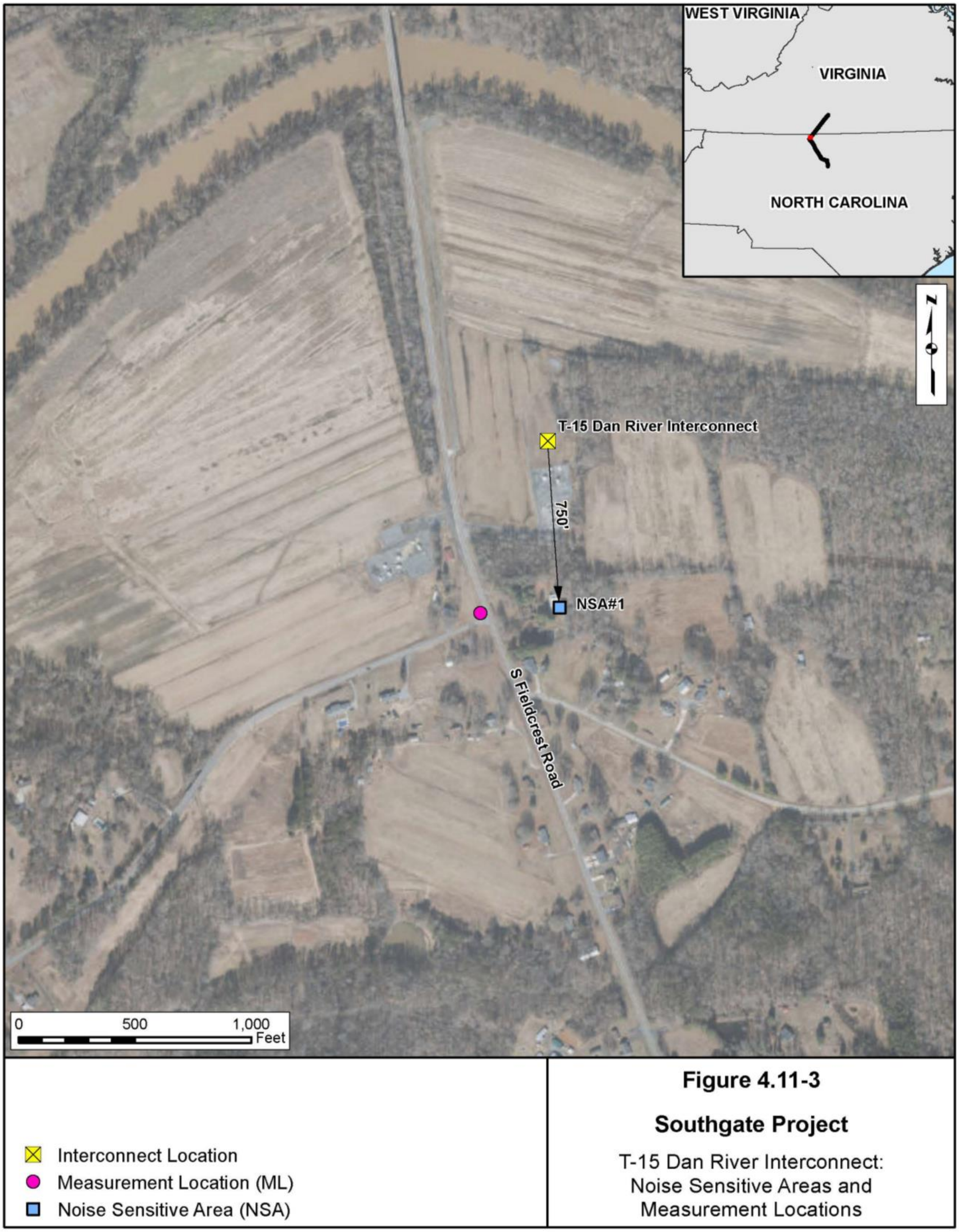


Figure 4.11-3

Southgate Project

T-15 Dan River Interconnect:
Noise Sensitive Areas and
Measurement Locations

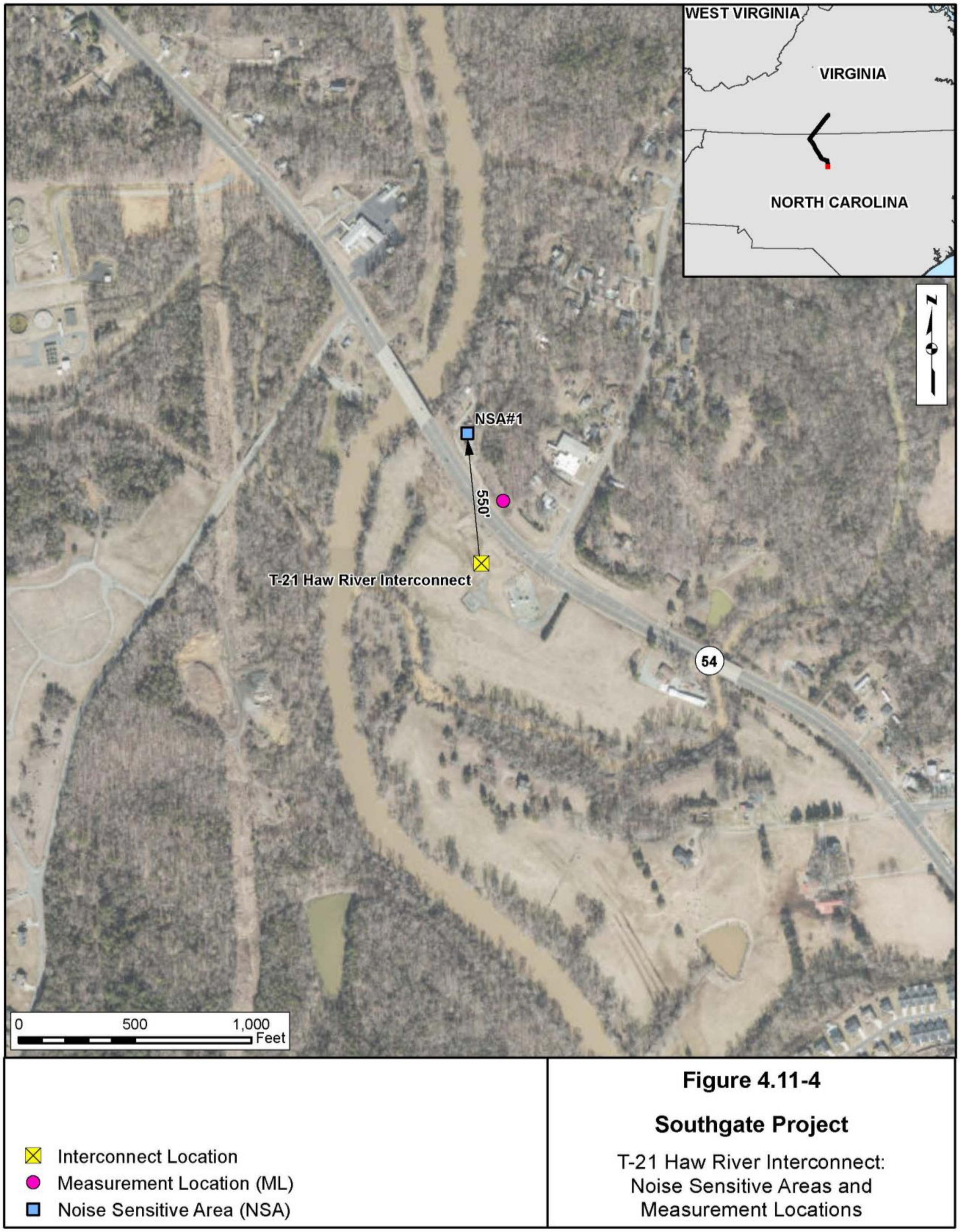


Figure 4.11-4

Southgate Project

T-21 Haw River Interconnect: Noise Sensitive Areas and Measurement Locations

Mountain Valley also conducted baseline noise surveys of potential HDD and conventional bore (railroad crossing) sites in July 2018. Figures 4.11-5 through 4.11-10 show the proximity and the direction of the NSAs to the respective activity. Noise survey results are summarized in table 4.11-10, and indicate that existing ambient background noise levels range from 39.7 to 58.9 dBA L_{dn}.

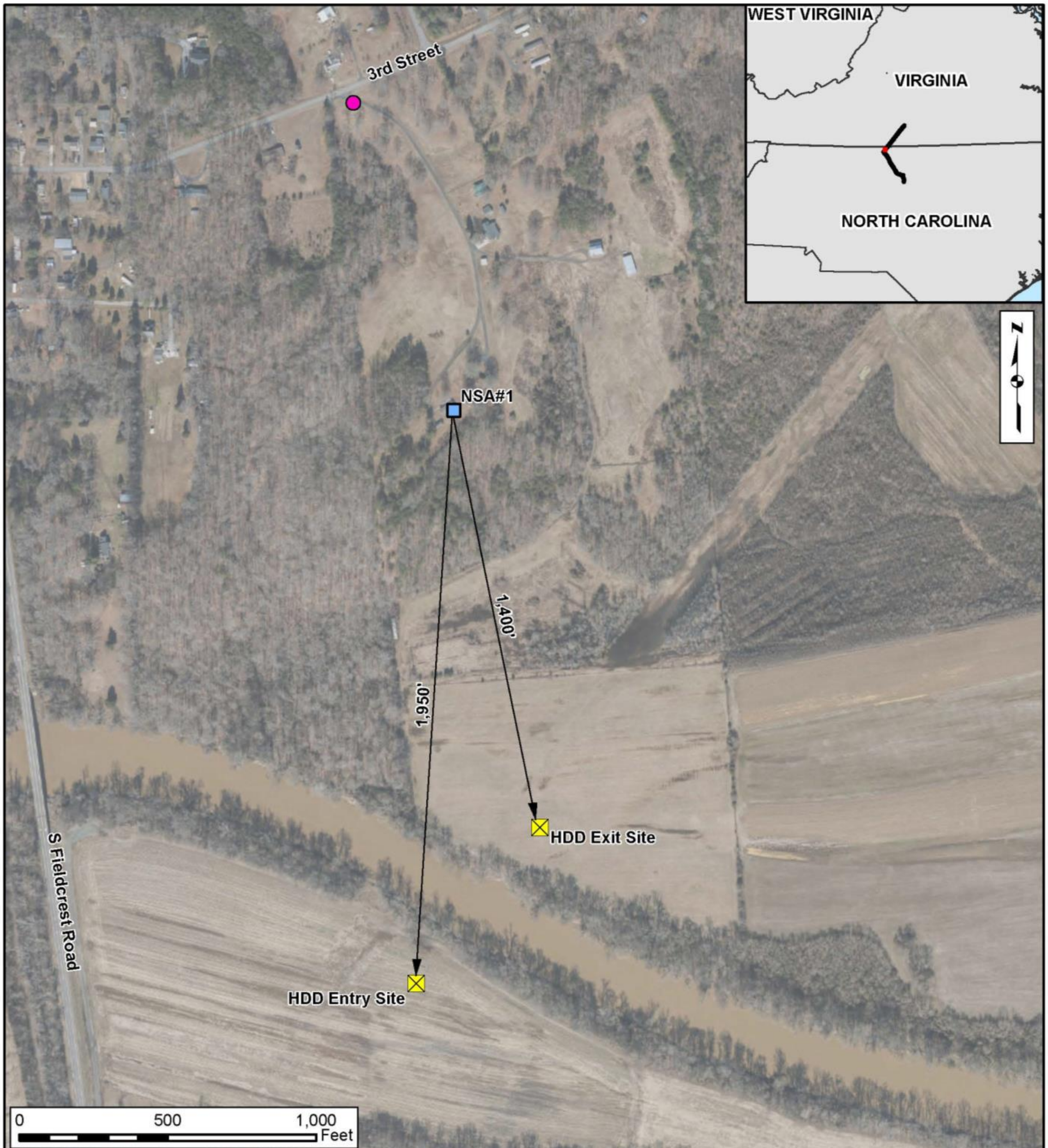
TABLE 4.11-10

Summary of Existing Ambient Noise Levels at HDD and Railroad Crossings for the Southgate Project

Activity/ NSA	NSA Land Use	Distance and Direction from Activity	Ambient Noise Levels (dBA) a/ b/ Daytime, L_d	Ambient Noise Levels (dBA) a/ b/ Nightime, L_n	Ambient Noise Level, L_{dn} (dBA)
Dan River HDD (MP 30.4)					
NSA 1	Residential	1,950 feet NW of HDD Entry	37.1	32.1	39.7
		1,400 feet N of HDD Exit			
Stony Creek Reservoir HDD (MP 63.8)					
NSA 1	Residential	1,400 feet NW of HDD Entry	37.1	32.1	39.7
		300 feet NW of HDD Exit			
Railroad Crossing 1 (MP 5.3)					
NSA 1	Residential	3,550 feet E	56.6	51.1	58.9
Railroad Crossing 2 (MP 25.0)					
NSA 1	Residential	3,000 feet S	38.8	33.3	41.4
Railroad Crossing 3 (MP 39.7)					
NSA 1	Residential	250 feet NW	43.2	37.7	45.5
Railroad Crossing 4 (MP 69.8)					
NSA 1	Residential	500 feet N	46.3	41.3	48.9

a/ Ambient noise surveys were conducted at each location for 10 minutes during the nighttime; daytime levels were estimated by applying the average day-night sound level difference from a nearby 24-hour measurement location (see table 4.11-9).

b/ Insect noise was removed by omitting sound energy in the whole octave bands above 1,000 hertz.



HDD Entry/Exit
Measurement Location (ML)
Noise Sensitive Area (NSA)

Figure 4.11-5

Southgate Project

Dan River HDD:
Noise Sensitive Areas and
Measurement Locations

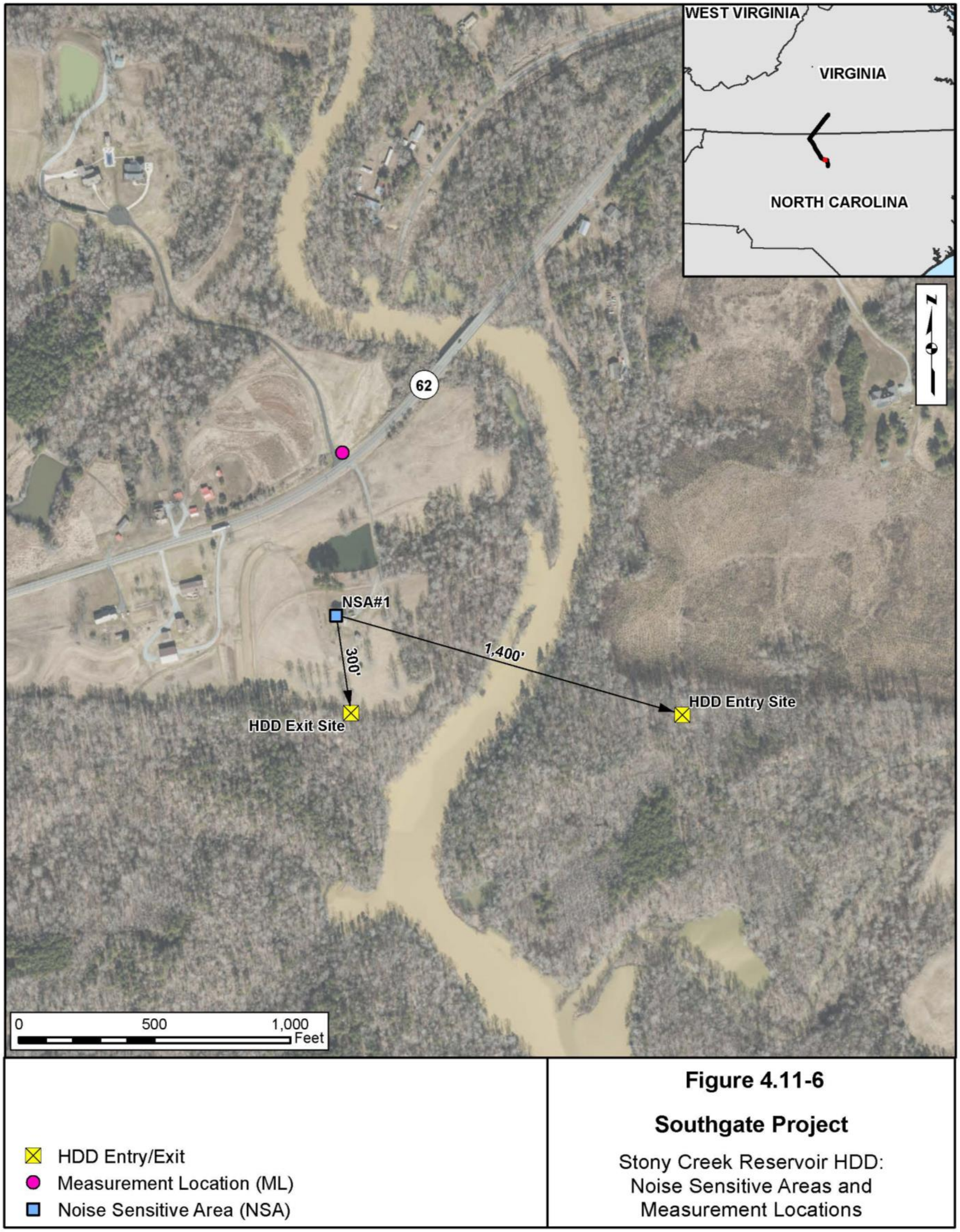
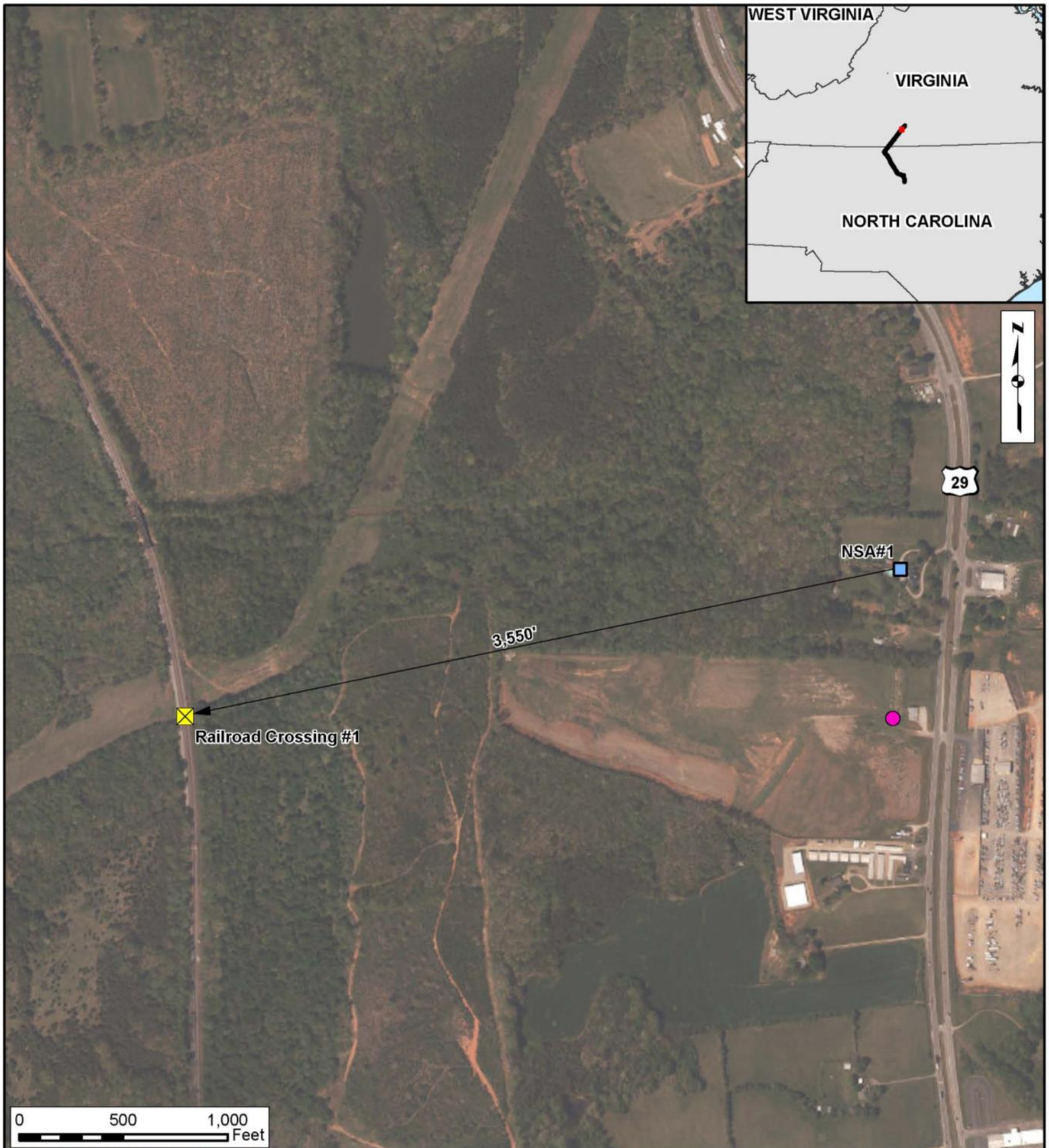


Figure 4.11-6

Southgate Project

Stony Creek Reservoir HDD:
Noise Sensitive Areas and
Measurement Locations

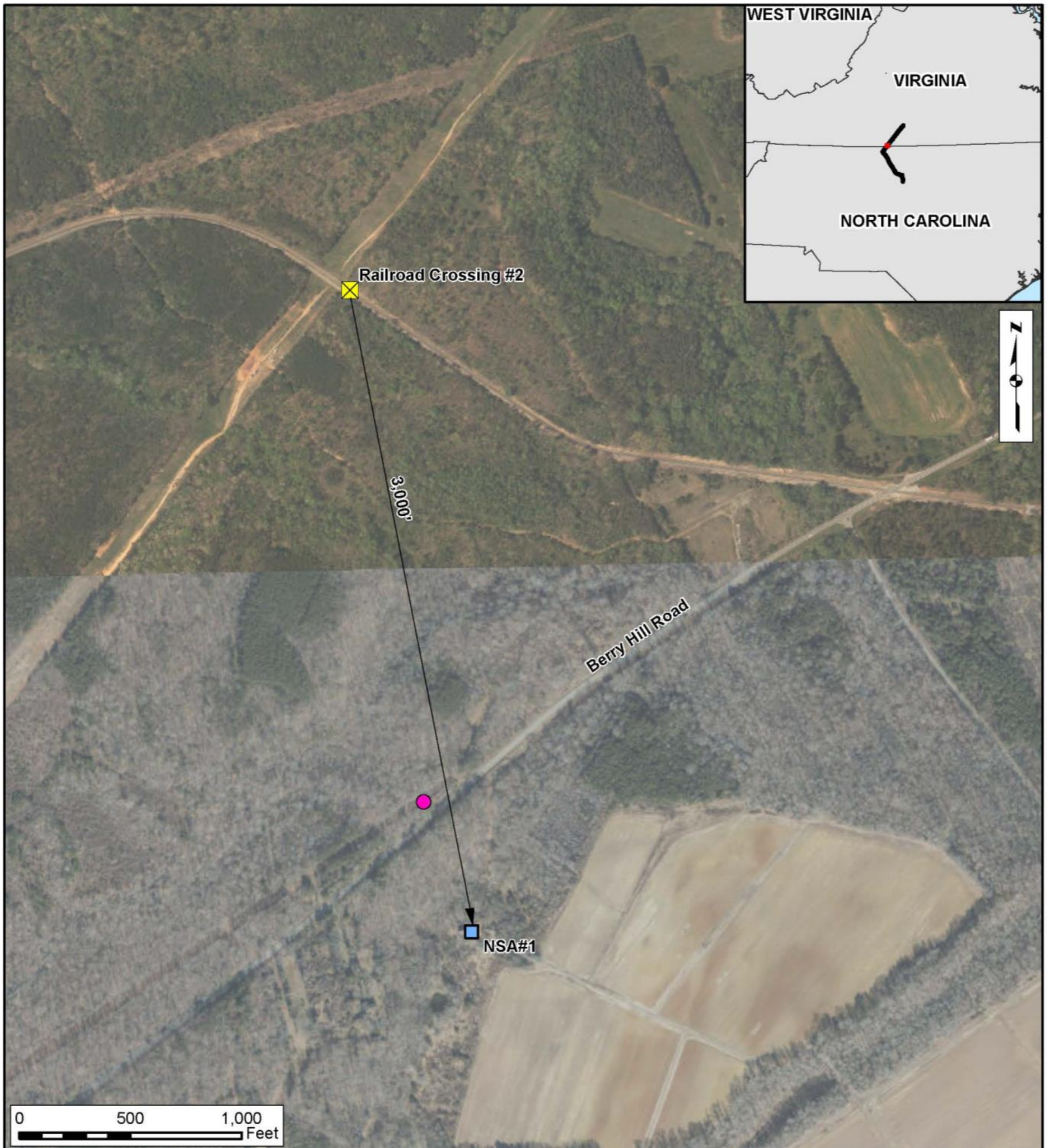


Crossing Location
Measurement Location (ML)
Noise Sensitive Area (NSA)

Figure 4.11-7

Southgate Project

Railroad Crossing 1:
Noise Sensitive Areas and
Measurement Locations

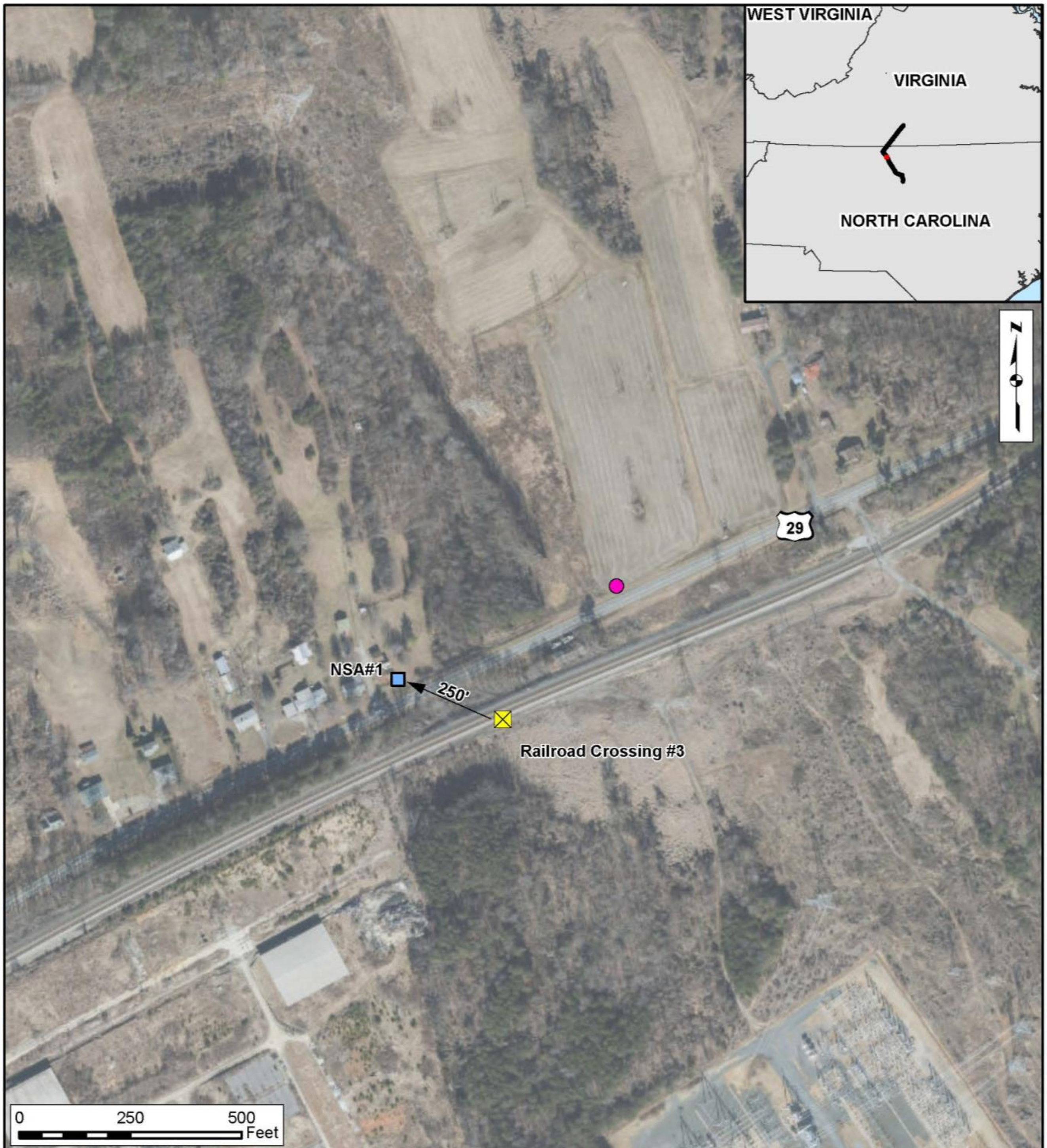


Crossing Location
Measurement Location (ML)
Noise Sensitive Area (NSA)

Figure 4.11-8

Southgate Project

Railroad Crossing 2:
Noise Sensitive Areas and
Measurement Locations

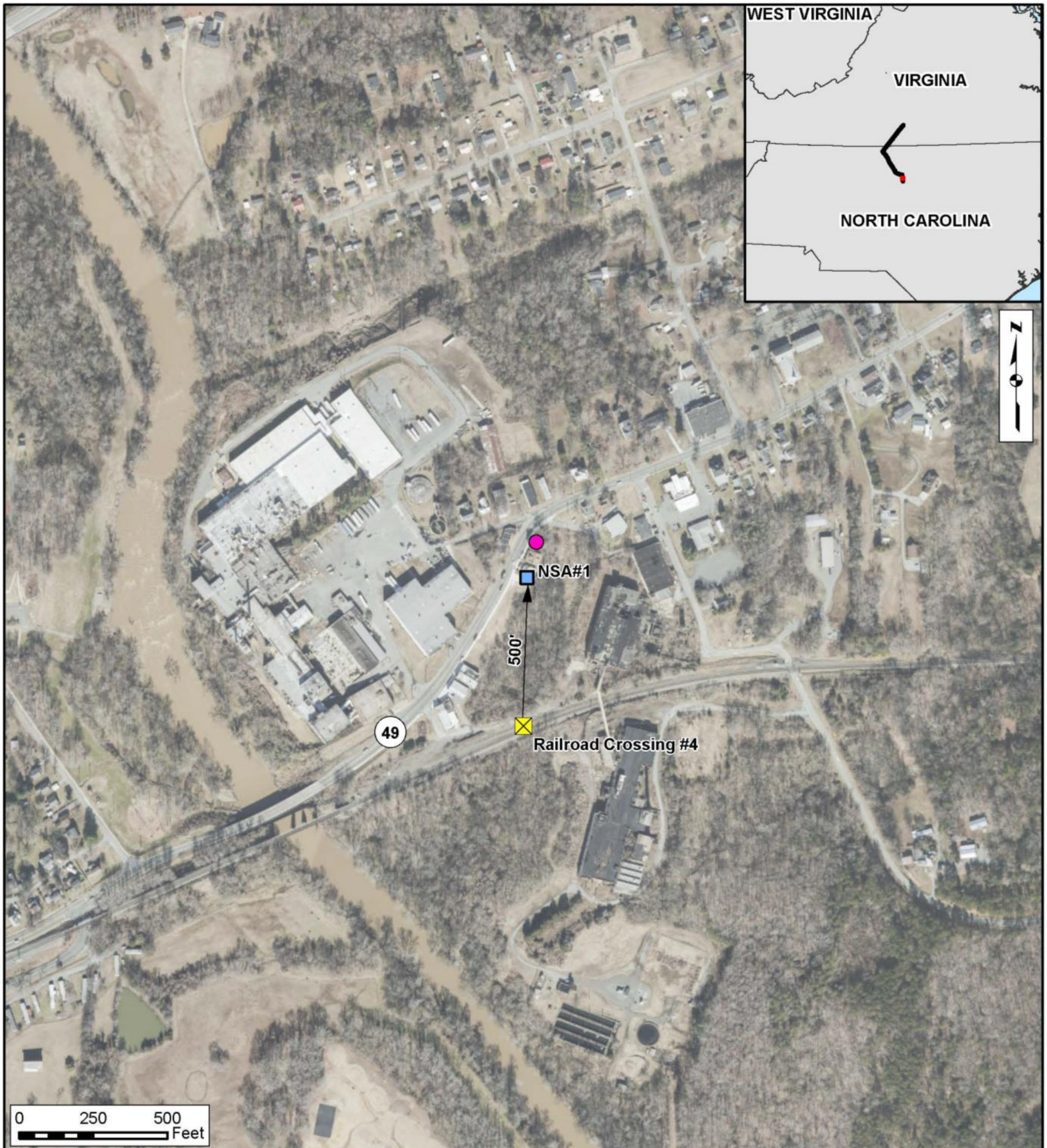


Crossing Location
Measurement Location (ML)
Noise Sensitive Area (NSA)

Figure 4.11-9

Southgate Project

Railroad Crossing 3:
Noise Sensitive Areas and
Measurement Locations



Crossing Location
Measurement Location (ML)
Noise Sensitive Area (NSA)

Figure 4.11-10

Southgate Project

Railroad Crossing 4:
Noise Sensitive Areas and
Measurement Locations

4.11.2.2 Noise Regulatory Requirements

The states of Virginia and North Carolina do not have regulations that would limit noise from construction or operation of the Project. While Rockingham and Alamance Counties have only nuisance-based regulations; Pittsylvania County has a numerical-based noise ordinance that would be applicable as summarized in table 4.11-11 below. The ordinance contains an exemption for sound generated by the Project construction provided such sound is limited between the hours of 7:00 a.m. and 10:00 p.m.

TABLE 4.11-11

Noise Control Ordinance for Pittsylvania County Code

	Noise Limitations (in dBA L_{eq})		
County/State	**Daytime (7:00 am – 10:00 pm)**	**Nighttime (10:00 pm – 7:00 am)**	**Receiving Land Use Category**
Pittsylvania County, VA	55	50	Noise Sensitive Zones a/
	57	52	Residential District
	57	52	Agricultural District
	67	62	Business District
	77	77	Industrial District

Source: Pittsylvania County Code, 1993

a/ A noise sensitive zone includes school, institution of learning, cemetery during memorial service, funeral homes, nursing homes, courtroom, place of public worship, or medical or veterinary facility.

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 (EPA, 1974). We have adopted this criterion and have used it to evaluate the potential noise impacts from construction and operation of the Project. The potential for noise impacts are assessed by comparing the proposed Project's noise levels with the 55 dBA noise level criterion at the nearest NSA. For nighttime noise where the background ambient noise levels are already above the 55 dBA noise level criterion, all efforts should be made to restrict noise level increases to less than 10 dBA over background.

With regards to compressor stations, the FERC regulations at 18 CFR 380.12(k)(4)(v)(A) state that the noise attributed to any new compressor station must not exceed an L_{dn} of 55 dBA at any pre-existing NSA such as schools, hospitals, and residences. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn}, for a facility to meet the L_{dn} 55 dBA limit, the facility must be designed such that a constant noise level on a 24-hour basis does not exceed 48.6 dBA L_{eq} at any NSA.

4.11.2.3 Noise Impacts and Mitigation

Construction Noise Impacts and Mitigation

Construction noise levels are rarely steady; instead, they fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near existing ambient levels. In addition, construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance, other noise sources, and the presence and extent of vegetation and intervening topography between the noise source and the sensitive receptor.

Noise level increases during construction would be intermittent and would generally occur during daylight hours, with the possible exception of HDD and conventional bore activities. Construction of the compressor station and other associated aboveground ancillary facilities would represent more localized noise sources and are discussed in conjunction with each component of the Project below.

Pipeline

Pipeline construction would result in noise along the entire length of the Project; however, noise impacts would be transient as construction progresses from one location to the next along the pipeline corridor. It is expected that construction-related noise would last for only a few days to weeks at any one location. Prevalent noise sources would come from internal combustion engines used by construction equipment (e.g., trucks, backhoes, excavators, loaders, cranes).

Construction equipment noise levels would typically be about 85 dBA at 50 feet when the equipment is operating at full load. There are about 45 occupied residences within 50 feet of the Project construction work areas. For the worst-case scenario (i.e., assuming no noise shield or barrier between the noise source and sensitive receptor), the nearest distance at which a sound level of 85 dBA attenuates to the 55 dBA noise criterion would be about 1,600 feet. Therefore, sensitive receptors within 1,600 feet of the construction equipment could be affected by the noise. However, construction noise would be intermittent and temporary, and no NSA would be expected to be exposed to significant noise levels for an extended period of time. Mountain Valley would mitigate pipeline construction-related noise by limiting most pipeline construction to daytime hours (7:00 a.m. to 7:00 p.m.) when ambient noise levels are often higher and most individuals are less sensitive to noise. Low noise generating activities (e.g., x-rays, inspections, hydrostatic tests, drying, etc.) may occur during limited nighttime hours. Mountain Valley would also notify local residence in advance of construction activities.

Compressor Station and Meter Stations

Construction activities for aboveground facilities would be primarily limited to daytime hours; however, specific situations related to safety, permit compliance, or other non-typical circumstances may necessitate limited nighttime work. The expected duration of construction is 18 months for the Lambert Compressor Station and 5 months for the meter stations. Mountain Valley used the Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) (version 1.1) to calculate noise generated from construction of the Lambert Compressor

Station and meter stations. The noisiest construction stage was determined to occur during the early earthmoving phase. Daytime work would include the use of up to three excavators, three bulldozers, three dump trucks, one generator, three drill rigs, two pile augers, and one roller (i.e., total sound power level of 129.9 dBA). Although there is uncertainty of the equipment that might be operating during nighttime construction, the noise assessment assumed the use of up to two excavators, two bulldozers, two dump trucks, three light plants, and one roller (i.e., total sound power level of 120.2 dBA).

Table 4.11-12 shows the predicted noise impacts on the worst-case NSAs from construction of the new compressor station and meter stations during the typical 12-hour daytime shift (7:00 a.m. to 7:00 p.m.). As shown in the table, noise levels due to daytime construction of the Lambert Compressor Station and LN 3600 Interconnect would be below the 55 dBA L_{dn} criterion at the nearest NSAs. Although the compressor station is located in Pittsylvania County, the noise ordinance does not apply to daytime construction. As a result, noise impacts from daytime construction of the Lambert Compressor Station and LN 3600 Interconnect would be localized, temporary, and less than significant.

TABLE 4.11-12

Estimated Noise Levels at Nearby Noise Sensitive Areas from Construction of Aboveground Facilities (12-Hour Daytime Shift)

Station / NSA	Ambient Noise Levels (dBA)		Construction Noise (dBA)		Construction + Ambient (dBA)		Increase over Ambient (dBA)	
	L_d	L_{dn}	L_d	L_{dn}	L_d	L_{dn}	L_d	L_{dn}
Lambert Compressor Station/Interconnect								
NSA 1	36.8	46.8	48.7	46.6	49.0	49.7	12.2	2.9
NSA 2	36.8	46.8	46.5	44.4	46.9	48.8	10.2	2.0
NSA 3	60.4	62.8	43.8	41.7	60.5	62.8	0.1	0.0
NSA 4	38.6	44.8	42.7	40.7	44.1	46.3	5.5	1.4
LN 3600 Interconnect								
NSA 1	47.2	49.7	51.2	49.1	52.7	52.4	5.4	2.7
T-15 Dan River Interconnect								
NSA 1	63.1	65.0	64.7	62.7	67.0	67.0	3.9	2.0
T-21 Haw River Interconnect								
NSA 1	62.8	65.0	67.1	65.1	68.5	68.1	5.6	3.1

Noise levels due to daytime construction of the T-15 Dan River and T-21 Haw River Interconnects would be above the FERC criterion of 55 dBA Ldn at the nearest NSAs. At these sites, the existing ambient noise levels are already above the 55 dBA noise level criterion. The noise increase above the existing day ambient noise level would 3.9 dBA and barely detectable to the human ear for the T-15 Dan River Interconnect, and 5.6 dBA and clearly noticeable for the T-21 Haw River Interconnect. Although these increases would be noticeable, the noise impacts would be localized, temporary, and occurring during daytime only.

Nighttime work would be conducted for specific situations related to safety, permit compliance, or other non-typical circumstances. Table 4.11-13 shows the predicted noise impacts on the worst-case NSAs from construction of the new compressor station and meter stations during a 24-hour shift. As shown in the table, noise levels due to 24-hour construction of the Lambert Compressor Station would be below the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. As a result, noise impacts would be intermittent, temporary, and less than significant. Mountain Valley is in discussion with Pittsylvania County to assess applicability of the Pittsylvania County Noise Ordinance with regards to 24-hour construction at the Lambert Compressor Station. Information will be updated in the final EIS.

TABLE 4.11-13

Estimated Noise Levels at Nearby Noise Sensitive Areas from Construction of Aboveground Facilities (24-Hour Shift)

Station / NSA	Ambient Noise Levels (dBA)		Construction Noise (dBA)		Construction + Ambient (dBA)		Increase over Ambient (dBA)	
	L_n	L_{dn}	L_n	L_{dn}	L_n	L_{dn}	L_n	L_{dn}
Lambert Compressor Station/Interconnect								
NSA 1	40.8	46.8	45.9	53.1	47.1	54.0	6.3	7.2
NSA 2	40.8	46.8	43.7	50.9	45.5	52.3	4.7	5.5
NSA 3	55.1	62.8	41.0	48.2	55.3	63.0	0.2	0.1
NSA 4	38.4	44.8	40.0	47.1	42.3	49.1	3.9	4.3
LN 3600 Interconnect								
NSA 1	42.1	49.7	48.5	55.4	49.4	56.4	7.3	6.7
T-15 Dan River Interconnect								
NSA 1	57.1	65.0	62.0	69.2	63.2	70.6	6.2	5.6
T-21 Haw River Interconnect								
NSA 1	57.2	65.0	64.4	71.5	65.2	72.4	8.0	7.4

Noise levels due to 24-hour construction of the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects would all be above the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. The noise increases above the existing day-night ambient noise levels would be 5.6 to 7.4 dBA and clearly noticeable to the human ear. Although these increases would be noticeable, the noise impacts would be intermittent and temporary. Furthermore, because of the uncertainty of the equipment operating during night construction, Mountain Valley would develop a *Nighttime Construction Noise Management Plan* before nighttime construction is required at the compressor station or meter stations. This plan would list the noise levels from the selected nighttime equipment at the nearest NSAs. If resulting noise is above 55 dBA L_{dn}, the plan would identify specific noise mitigation, such as noise barriers, quieter equipment, or partial equipment enclosures that would reduce noise levels to under 55 dBA L_{dn}.

To ensure that sensitive receptors near the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects would not be significantly affected by the noise levels from 24-hour construction, **we recommend that:**

- **<u>Prior to nighttime construction at the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects</u>, Mountain Valley should file its *Nighttime Construction Noise Management Plan* with the Secretary, for review and written approval by the Director of OEP.**

<u>Blasting</u>

Mountain Valley would conduct blasting to excavate where shallow bedrock is encountered. Noise and vibration impacts produced during blasting would be instantaneous and would vary based on a number of factors, such as the type and amount of explosives used, distance of the receptor to the blast site, below-ground depth of explosives, and minimization measures applied. At a distance of 50 feet, typical construction blasting noise levels have been documented at about 94 dBA and vibration at about 100 vibration decibels (VdB). If the vibration level at a structure reaches 90 to 102 VdB depending on the building type, there may be damage effects (FHWA, 2006b; FTA, 2006). Mountain Valley would conduct a noise and vibration assessment for nearby structures once blasting locations are identified.

Mountain Valley would conduct blasting operations in accordance with its *General Blasting Plan* and applicable regulations. Furthermore, before any blasting occurs, Mountain Valley's contractor would complete a Project/site-specific blasting plan for approval. If blasting is necessary within 150 feet of an occupied building, store, residence, business, farm, or other occupied area, Mountain Valley would perform pre- and post-blast inspections, and provide at least a 24-hour notice prior to initiating blasting operations. Mountain Valley would control vibration by limiting the size of charges and by using charge delays, which stagger each charge in a series of explosions. In the event of a landowner complaint regarding damage from blasting, Mountain Valley would negotiate a settlement with the landowner that may include repair or replacement. With implementation of these mitigation measures, significant noise and vibration impacts from blasting are not anticipated.

<u>Horizontal Direction Drilling</u>

Mountain Valley would use the HDD method to install the pipeline beneath the Dan River in Rockingham County, North Carolina and the Stony Creek Reservoir, in Alamance County, North Carolina. The expected drilling duration is 8 to 12 weeks for each crossing, under normal circumstances. Noise impacts at the nearest NSAs due to 24-hour HDD activities were calculated using the CadnaA noise model (version 2018, build 161.4801). The model assumed slight shielding and screening effects from the tanks and trailers on-site. Noise would be generated by HDD equipment at the entry point and at the exit point, and assumed equipment would operate simultaneously at both locations. Since Mountain Valley has yet to decide the drilling direction, two models were constructed for each HDD (i.e., each side modeled as both entry and exit) in order to identify the work-case scenario.

HDD equipment at the entry point includes a drill rig and engine-driven hydraulic power unit, engine-driven mud pump(s) and other engine-driven generator set(s); mud mixing/cleaning equipment and associated fluid systems shale shakers; crane(s), forklift(s), front-end loader(s), and/or truck(s); and engine-driven light plants (i.e., total sound power level of 115 dBA). HDD equipment at the exit point includes a backhoe or bulldozer; engine-driven generator set and small engine-driven pump; and engine-driven light plant (i.e., total sound power level of 103 dBA).

As shown in table 4.11-14, the worst-case noise level from the Dan River HDD would be below the FERC criterion of 55 dBA L_{dn} at the nearest NSA. HDD activities at the Stony Creek Reservoir would generate noise above the 55 dBA L_{dn} criterion. At this site, Mountain Valley would implement noise mitigation as follows: (1) use residential-grade exhaust mufflers on exhaust of all engines; and (2) use of a series of 12 to 14 foot tall noise barriers located 20 feet from the primary noise source. Based on modeling conducted by Mountain Valley, the use of the proposed mitigation would reduce the estimated noise level from Stoney Creek Reservoir HDD below the 55 dBA L_{dn} criterion for the nearest NSA. As such, noise impacts associated with HDD activities would be localized, temporary, and mitigated where necessary.

TABLE 4.11-14

Estimated Worst-Case Noise Levels at Nearby Noise Sensitive Areas Due to Horizontal Directional Drilling (24-Hour Shift)

HDD	Closest NSA Distance and Direction from HDD	Sound Levels (dBA) Ambient Noise Level (L_{dn})	Sound Levels (dBA) HDD Noise (L_{dn})	Sound Levels (dBA) HDD + Ambient (L_{dn})	Increase over Ambient (dBA)
Without Mitigation					
Dan River HDD	1,400 feet N	39.7	52.9	53.1	13.4
Stony Creek Reservoir HDD	300 feet NW	42.8	**60.6**	60.7	17.9
With Mitigation					
Stony Creek Reservoir HDD	300 feet NW	42.8	48.7	49.7	6.9

Conventional Bore

Pipeline would be installed beneath railroad at four locations utilizing the conventional bore construction method with the following equipment: an auger boring machine, six light plants, and two backhoes. Mountain Valley expects that each railroad crossings would require 24-hour construction activities for 2 to 3 days. If problems are encountered, construction could be extended for up to 14 days.

Mountain Valley used the CadnaA noise model (version 2018 build 161.4801) to estimate noise impacts at the nearest NSAs to the railroad crossings. The model assumed slight shielding and screening effects from the tanks and trailers on-site. Table 4.11-15 shows the predicted noise impacts on the worst-case NSAs due to construction from railroad crossings during a 24-hour shift. As shown in the table, noise levels would be below the FERC criterion of 55 dBA L_{dn} at the nearest NSAs to Railroad Crossings 1 and 2. Mountain Valley is in discussion with Pittsylvania County to assess applicability of the Pittsylvania County Noise Ordinance with regards to 24-hour construction of Railroad Crossings 1 and 2. Information will be updated in the final EIS.

Noise levels from Railroad Crossings 3 and 4 would be above the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. At these two locations, Mountain Valley would implement the following noise mitigation: (1) use residential-grade exhaust mufflers on exhaust of all engines; and (2) use of a series of 12 to 14 foot tall noise barriers located 20 feet from the primary noise source. As an alternative to the noise mitigation at Railroad Crossing 3 and/or 4, Mountain Valley may consider offering the residents compensation or temporary housing as a means of reducing the temporary construction noise impact. If all affected residents choose to accept compensation or temporary housing for the duration of the work (2 to 3 days), then the mufflers and barriers would not be necessary.

As shown in table 4.11-15, with mufflers and barriers as mitigation, noise levels from Railroad Crossing 3 remain above the FERC criterion of 55 dBA L_{dn} at the nearest NSA. In the event that sensitive receptors near Railroad Crossing 3 find the noise levels to be disruptive after proposed mitigation, Mountain Valley would also offer compensation or temporary housing (e.g., hotel or motel) accommodations as warranted, until the noise levels are remedied. As such, noise impacts associated with railroad crossings activities would be localized, temporary, and mitigated where necessary.

TABLE 4.11-15

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Railroad Crossings (24-Hour Shift)

Railroad Crossing	NSA Distance and Direction from Crossing	Sound Levels (dBA)			Increase over Ambient (dBA)
		Ambient Noise Level (L_{dn})	Crossing Noise (L_{dn})	Crossing + Ambient (L_{dn})	
Without Mitigation					
Railroad Crossing 1	3,550 feet E	58.9	45.1	59.0	0.2
Railroad Crossing 2	3,000 feet S	41.1	38.3	42.9	1.8
Railroad Crossing 3	250 feet NW	45.5	**69.5**	69.5	24.1
Railroad Crossing 4	500 feet N	48.9	**65.2**	65.3	16.4
With Mitigation					
Railroad Crossing 3	250 feet NW	45.5	**57.5**	57.8	12.3
Railroad Crossing 4	500 feet N	48.9	53.2	54.6	5.7

Operational Noise Impacts and Mitigation

Normal operations noise from the pipeline would be negligible. The only potential sound level increases associated with operation would be noise from vehicle and equipment use during maintenance and inspection activities. However, these activities would be transient, temporary, and not significantly more audible than normal vehicle traffic at the nearest NSAs along the pipeline right-of-way.

Noise from the Lambert Compressor Station would be generated from continuous operation of the equipment listed in table 4.11-3. The increase in noise would be sustained for the life of the Project. The CadnaA noise model (version 2018 build 161.4801) was used to estimate noise impacts at the nearest NSAs to the compressor station.

The data used for modeling included available data from equipment manufacturers and noise level measurements from other similar compressor stations. The models assumed an exhaust height of 45.5 feet per the planned turbine installations and vendor proposal. Certain noise mitigation measures, such as compressor building walls, roof, doors, and ventilation; turbine exhaust silencers and breakout (capable of meeting 45 dBA at 200 feet); turbine intake silencers and breakout (capable of meeting 73 dBA at 50 feet); underground suction and discharge piping; and acoustically lagged aboveground main gas piping were included as part of the noise modeling. Further, the compressor station would be located in an area with foliage ranging from grass and crops to areas of dense woods. For a conservative assumption, no foliage shield factor was applied.

Table 4.11-16 summarizes modeled noise levels on worst-case NSAs due to typical operation of the Lambert Compressor Station. As shown in the table, noise levels at each NSA due to typical compressor station operation would be below the FERC noise limit of 55 dBA. Noise increases over the existing ambient noise levels of 0.0 dBA to 3.7 dBA would range from not detectible to barely detectible to the human ear.

TABLE 4.11-16

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Operation of the Lambert Compressor Station

NSA	NSA Distance and Direction from Station	Sound Levels (dBA) Ambient Noise Level (L_{dn})	Sound Levels (dBA) Compressor Noise (L_{dn})	Sound Levels (dBA) Compressor + Ambient (L_{dn})	Increase over Ambient (dBA)
NSA 1	3,480 feet WSW	46.8	48.0	50.5	3.7
NSA 2	3,500 feet SW	46.8	41.6	47.9	1.1
NSA 3	3,290 feet SE	62.8	40.7	62.8	0.0
NSA 4	3,800 feet N	44.8	39.4	45.9	1.1

The Lambert Compressor Station would also be subject to the Pittsylvania County Noise Ordinance, which limits noise levels at the property lines. The northeast property line is zoned industrial; the highest noise level would be 65 dBA L_{eq} and would comply with the 77 dBA limit. The other property lines are classified as agricultural; the highest noise level would be 51.9 dBA L_{eq} at the southeast property line, which would comply with the nighttime limit of 52 dBA. Consequently, the compressor station would appear to be consistent with the Pittsylvania County Noise Ordinance.

Once the compressor station design is finalized, Mountain Valley would finalize and modify as needed the noise mitigation to ensure compliance with the FERC and Pittsylvania County noise requirements. To verify that the actual noise levels resulting from operation of the Lambert Compressor Station would comply with our noise limit and would not result in significant noise impacts, **we recommend that:**

- **<u>No later than 60 days after placing the Lambert Compressor Station (including the Interconnect) into service</u>, Mountain Valley should file a noise survey with the Secretary. If a full load condition noise survey is not possible,**

Mountain Valley should provide an interim survey at the maximum possible load within 60 days of placing the station into service and provide the full load survey within 6 months. If the noise attributable to the operation of the equipment at the station under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearest NSA, Mountain Valley 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. Mountain Valley should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.

Compressor Station Maintenance Blowdowns/Venting

A maintenance blowdown would occur at the Lambert Compressor Station when a unit is shut down for an extended period. It entails releasing of high pressure gas in the system in a controlled fashion (through a blowdown silencer capable of meeting 85 dBA at 3 feet) causing a temporary increase of noise level lasting approximately 5 minutes.

During a maintenance blowdown event, the worst-case predicted noise level (i.e., during nighttime) at the worst-case NSA would be below the FERC 55 dBA limit as shown in table 4.11-17. The noise increase above the existing nighttime ambient noise level would be 0.6 dBA and likely not detectible to the human ear. As a result, noise impacts from maintenance blowdowns would be negligible. Mountain Valley is in discussion with Pittsylvania County to assess applicability of the Pittsylvania County Noise Ordinance with regards to maintenance blowdown events. Information will be updated in the final EIS.

TABLE 4.11-17

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Maintenance Blowdown at the Lambert Compressor Station

		Sound Levels (dBA)			
NSA	NSA Distance and Direction from Station	Ambient Noise Level (L_n)	Blowdown Noise (L_n)	Blowdown + Ambient (L_n)	Increase over Ambient (dBA)
NSA 1	3,480 feet WSW	44.5	36.8	45.1	0.6

Compressor Station Emergency Shutdown

An ESD blowdown event would occur at the Lambert Compression Station when the ESD system senses irregularity in operation and automatically shuts down the whole station. This would cause elevated noise due to the release of gas from all of the station's piping through a series of silencers. The estimated noise from the discharge, suction, and fuel gas vents are 138, 133, and 120 dBA, respectively, which would be high enough to be audible within a 1-mile radius. However, these noise levels would occur only during the first few seconds of ESD venting, during the period with the highest upstream pressure. Thereafter, the noise levels would drop quickly over the 10-minute venting period as the upstream pressure decreases.

Table 4.11-18 shows the estimated maximum noise level (L_{max}) and 10-minute average noise level (L_{eq}) on worst-case NSAs from an emergency shutdown of the Lambert Compressor Station. As shown in the table, the noise levels would be below the FERC noise limit of 55 dBA for all NSAs during a 24-hour average period. Because ESD blowdown events are extremely rare and would take place only in the event of an emergency or when the system is tested once every year, impacts on NSAs would not be considered significant. Mountain Valley is in discussion with Pittsylvania County to assess applicability of the Pittsylvania County Noise Ordinance with regards to ESD blowdown events. Information will be updated in the final EIS.

TABLE 4.11-18

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Emergency Shutdown of the Lambert Compressor Station

NSA	NSA Distance and Direction from Station	Sound Levels (dBA) Ambient Noise Level (L_{dn})	Maximum ESD Noise (L_{max})	10-Minute Average ESD Noise (L_{eq})	24-Hour Average ESD Noise (L_{dn})	ESD + Ambient (L_{dn})	Increase over Ambient (dBA)
NSA 1	3,480 feet WSW	46.8	63.9	58.9	47.3	50.1	3.3
NSA 2	3,500 feet SW	46.8	63.4	58.4	46.8	49.8	3.0
NSA 3	3,290 feet SE	62.8	56.1	51.1	39.5	62.8	0.0
NSA 4	3,800 feet N	44.8	55.5	50.5	38.9	45.8	1.0

Compressor Station Vibration

Mountain Valley conducted an analysis of the impacts of low-frequency[39] noise at Lambert Compressor Stations to assess the potential for vibration at nearby NSAs. Pursuant to ANSI 12.2-2008 Criteria for Evaluating Room Noise, low-frequency noise can result in acoustically induced vibrations if the sound pressure level (SPL) is above 65 dB in the 31.5 Hertz (Hz) octave band or above 70 dB in the 63 Hz octave band. The Lambert Compressor Station would generate approximately 50 dB at 31.5 Hz and 50 dB at 63 Hz at the closest NSA. Consequently, we conclude there would be no adverse low-frequency noise induced vibration at any NSA from operation of compressor station.

Meter Stations

Noise from the associated meter stations would be generated mainly by flow control valves installed at each interconnect. The increase in sound would be for the life of the Project. Table 4.11-19 shows the predicted operational worst-case noise levels at the nearest NSAs. As shown in the table, the noise levels contributed by operations of the interconnects would not exceed the

39 Frequency is the number of times sound fluctuation occurs measured in cycles per second called Hertz (Hz). Human hearing covers the frequency range of 20 Hz to 20,000 Hz (FTA, 2006).

FERC noise criterion of 55 dBA. Noise level increases over the existing ambient at NSAs would be 0.0 to 0.1 dBA, which is likely not detectible to the human ear. As a result, noise impacts from meter stations would be negligible.

TABLE 4.11-19

Estimated Noise Levels at Nearby Noise Sensitive Areas Due to Operation of the Meter Stations

Meter Station a/	NSA Distance and Direction from Station	Sound Levels (dBA) Ambient Noise Level (L_{dn})	Station Noise (L_{dn})	Station + Ambient (L_{dn})	Increase over Ambient (dBA)
LN 3600 Interconnect	1,700 feet NNW	49.7	27.7	49.7	0.0
T-15 Dan River Interconnect	750 feet S	65.0	46.8	65.1	0.1
T-21 Haw River Interconnect	550 feet N	65.0	41.8	65.0	0.0

a/ Noise levels for the Lambert Interconnect are included with the Lambert Compressor Station; see table 4.11-16.

4.11.2.4 Conclusions Regarding Noise Impacts and Mitigation

Noise generated during the construction phase would cause noise levels above the FERC noise criterion at certain NSAs. Construction noise would be heard by members of the public and residents near to the construction areas. However, construction noise is typically temporary and localized. With implementation of the measures proposed by the Mountain Valley and recommended by FERC, construction noise impacts would be minimized or mitigated to the extent practicable. Similarly, operational noise impacts would be limited to areas near the aboveground facilities. Considering Mountain Valley’s proposed mitigation measures and our recommendations, all aboveground facilities would comply with our noise criteria of 55 dBA L_{dn} and should cause no adverse noise vibration. Therefore, we conclude that the noise associated with construction and operation of the Project would not result in a significant impact on the local noise environment and residents.

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. In the unlikely event of a leak, natural gas, which is lighter than air, should dissipate into the atmosphere. However, a spark or ignition at the point of the release could result in a fire or explosion following a major pipeline rupture. Those risks are ameliorated by pipeline design and safety regulations mandated by the DOT, and measures that would be implemented by Mountain Valley as part of its *Emergency Response Plans*[40]. Below we discuss historic incidents, in order to quantify risks.

The primary component of natural gas, CH_4, 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 reduce the hazards release of natural gas compressor station's pneumatic control systems are designed to use compressed air rather than natural gas, which minimizes any venting or leaking at stations. Further, the use of turbine compressors instead of reciprocating compressors and micro-turbines for on-site power instead of reciprocating compressor generators act to prevent or minimize leakage.

Natural gas is buoyant at atmospheric temperatures 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. Methane has an auto-ignition temperature of 1,000°F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. A flammable concentration of natural gas within an enclosed space in the presence of an ignition source can explode.

4.12.1 Safety Standards

The DOT is mandated to regulate pipeline safety under 49 U.S.C. 601. The DOT's PHMSA administers the national regulatory pipeline safety program for the nation's interstate and intrastate pipelines and requires that pipeline operators design, construct, test, operate, and maintain their pipeline facilities in compliance with the federal pipeline safety regulations. 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.

PHMSA works closely with state pipeline safety programs. The 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 the DOT's agent to inspect interstate facilities within its boundaries; however, the 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.

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40 Mountain Valley's Emergency Response Plan was included as Attachment 1d-1 to Mountain Valley's March 5, 2019 response to the February 13, 2019 FERC EIR. The Emergency Response Plan can be viewed on the FERC website at http://www.ferc.gov. Using the "eLibrary" link, select "Advanced Search" from the eLibrary menu and enter 20190305-5214 in the "Numbers: Accession Number" field.

Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* dated January 15, 1993, between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the 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. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the 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 the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable. The pipeline and aboveground facilities associated with the Project must be designed, constructed, operated, and maintained in accordance with the DOT's *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. The DOT regulations specify material requirements and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The federal pipeline safety regulations also define area classifications, based on population density near pipeline facilities, and specify 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; and
- 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 conform to higher standards in more populated areas. Class locations for the Project have been determined based on the relationship of the pipeline centerline to other nearby structures and manmade features. Table 4.12-1 summarizes the class locations for the Project. The majority of the pipeline routes would be in Class 1 areas.

TABLE 4.12-1

Lengths of Area Classifications Crossed by the Southgate Project

State/County	Class 1 (miles)	Class 2 (miles)	Class 3 (miles)
Virginia			
Pittsylvania	18.56	7.15	0.27
Virginia Total	*18.56*	*7.15*	*0.27*
North Carolina			
Alamance	9.42	6.94	1.56
Rockingham	20.58	6.89	0.03
North Carolina Total	*30.0*	*13.83*	*1.59*
Mountain Valley Southgate Project Total	**48.56**	**20.98**	**1.86**

Mountain Valley has procedures in place to monitor for changes in population density. If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, Mountain Valley would revise the MAOP to conform to the new class. This would be achieved by reducing the MAOP or replacing the segment with pipe of sufficient grade and wall thickness, if required to comply with DOT requirements for the new class location. Mountain Valley has stated that it would also increase pipeline patrol frequency and pressure testing, or would decrease the percent specified minimum yield strength (pipeline stress) of a pipe segment in areas where population densities change.

The DOT Pipeline Safety Regulations require operators to develop and follow a written Integrity Management Program (IMP) 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 IMP that applies to all High Consequence Areas (HCA).

We received comments about the potential effects of a pipeline rupture and natural gas ignition. It should be noted that if a pipeline rupture does occur, the natural gas does not necessarily ignite. However, 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 IMP to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for the 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 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.

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.

The potential impact radius (PIR) for the 16- and 24-inch-diameter Project with a MAOP of 1,440 psig is 419 feet and 628 feet, respectively.

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 IMP to those sections of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan in Subpart O of Part 192, Gas Transmission Pipeline Integrity Management. Table 4.12-2 lists the HCAs for the Project, which have been determined based on the relationship of the pipeline centerline to nearby structures.

[41] The potential impact circle is a circle of radius equal to the potential impact radius.

TABLE 4.12-2

Location of High Consequence Areas for the Southgate Project

County	Start MP	End MP	Length (miles)	Class Location
Virginia				
Pittsylvania	2.89	2.90	0.01	Class 1
	2.90	3.34	0.44	Class 2
	4.04	4.20	0.16	Class 2
	4.20	4.30	0.10	Class 3
	4.30	4.40	0.10	Class 2
	4.40	4.51	0.11	Class 1
	19.19	19.40	0.21	Class 2
	19.40	19.50	0.10	Class 3
	19.50	19.90	0.40	Class 2
	19.90	19.97	0.07	Class 3
	19.97	20.17	0.20	Class 2
North Carolina				
Rockingham	39.70	39.97	0.27	Class 2
	40.34	40.60	0.26	Class 2
Alamance	56.69	57.06	0.37	Class 1
	69.21	69.42	0.21	Class 3
	69.47	69.94	0.47	Class 3
	72.70	72.80	0.35	Class 2
	72.80	72.90	0.10	Class 3
	72.90	73.05	0.15	Class 2

The pipeline and aboveground facilities for the Project 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 Mountain Valley would implement to ensure the safety of the Project are described in section 2.0, including welding, inspection, and integrity testing procedures.

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.

In addition to adhering to the requirements described above, the integrity of completed welds would be visually inspected and tested using non-destructive methods such as x-ray radiography or ultrasound. Any unacceptable welds would be repaired and re-welded. Mountain Valley has also stated that it would meet or exceed pipeline safety regulations including installing remote controlled vales, which are not currently required by PHMSA.

The DOT 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 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. 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 the DOT's requirements.

In accordance with DOT regulations, the proposed facilities would be regularly inspected for leakage and potential pipeline hazards such as construction activity, encroachments, and evidence of recent unmonitored excavations 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 and maintaining MLVs and meter stations; and
- conducting leak surveys at least once every calendar year or as required by regulations.

Cathodic protection would be installed along the entire length of the new pipelines to prevent corrosion. Mountain Valley 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.

The DOT regulations specified in Part 192 require that the applicant 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. Mountain Valley would utilize the emergency procedures contained in the Project *Emergency Response Plan*, which require communication with emergency responders on an annual basis. Local contact phone numbers, external contact information, equipment or resources available for mobilization, and any specific procedures to be followed for Mountain

Valley would be incorporated into the *Emergency Response Plan* prior to commencement of pipeline operations. The fire departments of the states of Virginia and North Carolina have specific requirements for staffing, training, and equipment that allow them to fight pipeline related fires. The locations of fire stations in proximity to the Project are provided in section 4.9.3.

Mountain Valley would 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.

Mountain Valley would establish and maintain liaison with appropriate fire, police, and public officials in a variety of ways. Mountain Valley'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 Mountain Valley's 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 Mountain Valley for more information.

Mountain Valley's communications with local emergency responders may involve individual meetings, group meetings, or direct mailings to build and maintain a relationship with the appropriate emergency personnel and ensure their knowledge and familiarity with ESD and isolation systems and protocol. In addition, Mountain Valley would perform and financially support periodic emergency exercises and mock emergency drills with local government, law enforcement, and emergency response agencies, subject to agency availability and willingness to participate. Additional training materials, including the PHMSA – Emergency Response Guidebook, National Association of State Fire Marshals – Pipeline Emergencies textbook, would also be made available to emergency personnel.

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 PHMSA. On January 19, 2017, PHMSA issued a final rule entitled, "Operator Qualification, Cost Recovery, Accident and Incident Notification, and Other Pipeline Safety Changes." The rulemaking lays out a specific timeframe requirement for telephonic or electronic notifications of accidents and incidents. The rule also amends drug and alcohol testing requirements, and incorporates consensus standards by reference for inline inspection and Stress Corrosion Cracking Direct Assessment. The rule addresses mandates included in the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011. Incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involve property damage, including cost of gas lost, of more than $50,000, in 1984 dollars (approximately $115,499.04 in 2016 [Bureau of Labor and Statistics, 2016]).

During the period from 1999 through 2018, 2,119 significant incidents were reported on the more than 301,000 total miles of natural gas transmission pipelines nationwide (PHMSA, 2017).

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12-3 provides a distribution of the causal factors as well as the number of each incident by cause from 1999 to 2018.

TABLE 4.12-3

Natural Gas Transmission Dominant Incident Causes, 1999 – 2018

Incident	Number of Incidents	Percentage
Corrosion	410	19.3
Excavation **a/**	340	16.0
Pipeline material, weld, or equipment failure	704	33.2
Natural force damage	229	10.8
Outside force **b/**	148	7.0
Incorrect operation	85	4.0
All other causes **c/**	203	9.6
Total	**2,119**	**100**

a/ Includes third-party damage
b/ Fire, explosion, vehicle damage, previous damage, and unintentional damage
c/ Miscellaneous causes or other unknown causes
Source: PHMSA, 2019

The dominant causes of pipeline incidents from 1999 to 2018 were corrosion and pipeline material, weld, or equipment failure, constituting 33.2 percent of all significant incidents. The pipelines included in the data set in table 4.12-3 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.

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 4.12-4, 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 actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12-4

Incidents Caused by External Corrosion and Level of Protection (1970 – June 1984)

Corrosion Control	Incidents per 100 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 33.8 percent of significant pipeline incidents from 1999 to 2018. 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 4.12-5 provides a breakdown of outside force incidents by cause.

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of 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 pre-construction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

TABLE 4.12-5

Outside Forces Incidents by Cause (1999 – 2018) a/

Cause	Number of Incidents	Percent of All Incidents
Operator excavation damage	48	2.3
Previous excavation damage	14	0.7
Third-party excavation damage	275	13.0
Unspecified excavation damage	3	0.1
Earth movement	38	1.8
Heavy rains/floods	103	4.9
High winds	15	0.7
Lightning	26	1.2
Temperature	31	1.5
Natural force damage (unspecified/other)	16	0.7
Electrical arcing from other equipment/facility	4	0.2
Fire/explosion	16	0.8
Fishing or maritime activity	8	0.4
Intentional damage	5	0.2
Maritime equipment or vessel adrift	2	0.1
Other outside force	15	0.7
Previous mechanical damage	9	0.4
Unspecified outside force	1	0.0
Vehicle (not engaged with excavation)	88	4.2
Total	**717**	**33.8**

a/ Excavation, Outside Force, and Natural Force from table 4.12-3
Source: PHMSA, 2019

4.12.3 Impacts on Public Safety

The service incident data summarized in table 4.12-3 include pipeline failures of all magnitudes with widely varying consequences. Table 4.12-6 presents the average annual fatalities that occurred on natural gas transmission lines between 2010 and 2018. The data have been separated into employees and nonemployees to better identify a fatality rate experienced by the general public. Fatalities among the public averaged three per year over the 20-year period from 1999 to 2018.

TABLE 4.12-6

Injuries and Fatalities – Natural Gas Transmission Pipelines

Year	Injuries		Fatalities	
	Employees	**Public**	**Employees**	**Public**
2010 a/	3	58	0	10
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
2017	1	2	1	2
2018	2	5	0	1

a/ All of the public injuries and fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.

Source: PHMSA, 2019a

The majority of fatalities from natural gas pipelines are associated with local distribution pipelines. These pipelines are not regulated by the 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 the FERC-regulated interstate natural gas transmission pipelines. Therefore, incident statistics inclusive of distribution pipelines are inappropriate to use when considering natural gas transmission projects.

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table 4.12-7 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously because individual exposures to hazards are not uniform among all categories. As indicated in table 4.12-7, 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.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1999 to 2018, there were an average of 106 significant incidents and 3 fatalities per year. The number of significant incidents distributed over the more than 300,000 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. Thus, operation of the Project would represent only a slight increase in risk to the nearby public.

TABLE 4.12-7

Nationwide Accidental Deaths a/

Type of Accident	Annual Number of Deaths
All accidents	169,936
Motor vehicle	40,231
Poisoning	64,795
Falls	36,338
Drowning	3,709
Fire, smoke inhalation, burns	2,812
Floods **b/**	80
Lightning **b/**	20
Tornado **b/**	10
Natural gas distribution lines **c/**	10
Natural gas transmission lines **c/**	3

a/ All data, unless otherwise noted, reflect 2017 statistics from CDC, 2019.
b/ Reflects 2018 data from NWS, 2019.
c/ 20-year average (1999-2018) from PHMSA, 2019b; c.

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 U.S. Department 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 U.S. 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 along the Project 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, Mountain Valley 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 U.S. Department of Homeland Security to continually improve pipeline safety would minimize the risk of terrorist sabotage of the projects 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 these particular projects should not be constructed.

4.12.5 Reliability and Safety Conclusion

The pipeline and aboveground facilities associated with the Project will 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 natural gas safely.

We received several comments about the potential effects of a pipeline rupture and natural gas ignition (the area of potential effect is sometimes referred to as the potential impact radius). While a pipeline rupture does not necessarily ignite, the DOT does publish rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an IMP to minimize the potential for an accident. Mountain Valley would follow federal safety standards for pipeline class locations based on population density. The DOT regulations are designed to ensure adequate safety measures are implemented to protect all populations. We conclude that Mountain Valley's compliance with applicable design, construction and maintenance standards, and DOT safety regulations would be protective of public safety.

4.13 CUMULATIVE IMPACTS

Cumulative impacts are those that result from adding a project's impacts on a specific resource to the impacts of other past, present, and reasonably foreseeable projects' impacts on that same resource. We identified other projects near the Southgate Project to determine whether the Southgate Project's impacts would result in a cumulative impact on the environment when combined with other projects' impacts. Although the individual impact of each separate project may be minor, the additive effects of multiple projects could be significant.

The environment that would be affected by the Southgate Project, as it exists today reflects the impacts of natural processes, human influences, and other innumerable activities occurring over thousands of years. Beginning with the original settlement of North America by Native Americans, the Southgate Project area has been affected by human activities for over 15,000 years. European settlers arriving in the 17th Century further affected the environment through increased agricultural and timbering activities. As the human population grew, resources such as wetlands and forests were modified or converted to satisfy growing demand for land and timber. Since 1977, the annual loss of forested land in Virginia is estimated to be 16,000 acres per year (VADOF, 2018). The majority of this loss has been attributed to urban development, followed by agriculture (VADOF, 2019). Similarly, it is estimated that at least half of the wetlands in North Carolina have been lost since pre-Colonial times (Dahl, 1990); however, it is difficult to determine an exact figure given the lack of reliable historical data. Wetland loss is attributed to changes in land use practices such as farming and residential development (USGS, 1996). Forested land in North Carolina has declined by approximately 1.6 million acres since the mid-1960's (NCFS, 2017b). Today approximately 19 million people reside in Virginia and North Carolina combined.

Although the region has been substantially affected by human activity, natural resources remain throughout the landscape. Based on USGS data, Virginia and North Carolina currently have a total of approximately 1.0 and 5.7 million acres of wetlands, respectively. In 2018, the VADOF estimated more than 62 percent of the state, approximately 16 million acres, qualified as forestland (VADOF, 2018). North Carolina's forests were estimated to cover 18.8 million acres as of 2017, or 60 percent of the land area in the state (NCFS, 2017b).

As described in the previous sections, the existing environment is representative of the impacts of past projects and actions. In this analysis, we consider the impacts of past projects to have become part of the affected environment (environmental baseline), which is described and evaluated in the preceding environmental analyses; however, ongoing effects of past actions that are relevant to the analysis are also considered. Furthermore, the CEQ in a memorandum regarding analysis of past actions issued on June 24, 2005, stated: "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). "Present" projects are those currently ongoing (either being constructed or are in operation) and affecting the environment in such a manner that could contribute to a cumulative impact. "Reasonably foreseeable" projects are proposed projects or developments that have applied for a permit from a local, state, or federal authority or planned projects, which have been publicly announced.

For a cumulative impact to occur, another project(s) must impact the same resource(s) as the Southgate Project. Impacts often vary in extent and duration. For example, a project's impact on cultural resource sites is localized in nature, with some exceptions, and typically not affecting other sites. Whereas, a project's impact on air quality could be measured over a relatively large distance. We account for this variation by considering resource-specific geographic scopes. Within each geographic scope, other projects' impacts when combined with those of the Southgate Project could result in a cumulative impact. Continuing the use of cultural resources and air quality as examples, the geographic scope for cultural resources is limited to the area within which sites could be directly or indirectly affected by another project(s) and would be significantly smaller than the geographic scope for air quality. Projects located outside a geographic scope are not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the Southgate Project. Table 4.13-1 describes the resource-specific geographic scopes for this cumulative impact analysis.

When determining the significance of a cumulative impact, we consider the duration of the impact; the geographic, biological, and/or social context in which the impact would occur; and the magnitude and intensity of the impact. For the purposes of this analysis, we are including the following resources: soils, groundwater, surface water, and wetlands; vegetation; wildlife; fisheries and aquatic resources; land use, recreation, special interest areas, and visual resources; socioeconomics and environmental justice; cultural resources; and air quality and noise. Most of the impacts resulting from construction and operation of the Southgate Project would be temporary and localized, would be contained within the right-of-way and extra workspaces, and when added to the impacts of other projects are not expected to result in significant cumulative impacts. Exceptions to the limited nature of cumulative impacts exist where the impacts may migrate outside of designated work areas, such as turbidity and sedimentation, air emissions, and noise. Impacts geological resources are localized, temporary, and limited to the immediate Southgate Project workspace, and therefore, we determined that cumulative impacts would not occur on geological resources. For each environmental resource, the potential direct and indirect impacts associated with the Southgate Project are discussed in relation to the cumulative effects that may occur when they are added to other past, present, or reasonably foreseeable projects within the geographic scope of analysis, as described below.

TABLE 4.13-1

Geographic Scope for Cumulative Impact Analysis

Resource(s)[1]	Cumulative Impact Geographic Scope	Justification for Geographic Scope
Soils	Construction workspaces	Impacts on soils would be highly localized and primarily limited to the Southgate Project footprint during active construction. Cumulative impacts would only occur if other geographically overlapping or abutting projects were constructed at the same time as the Southgate Project.
Groundwater, Wetlands, Vegetation, Wildlife	Hydrologic Unit Code (HUC) 12 Watershed	A HUC-12 watershed is a natural boundary to appropriately assess impacts on most biological resources including wetlands, vegetation, and wildlife. The HUC-12 sub-basin also accounts for the potential of inadvertent spills that could affect groundwater. Cumulative effects on biological resources typically are assessed within watershed boundaries due to the connectivity between biotic and abiotic resources that occurs within a drainage system. We chose the HUC-12 sub-level watershed for these resources because of the small scale of the Southgate Project's ground disturbance in relation to the area encompassing surrounding watersheds.
Surface Water Resources, Fish, and Aquatic Life	HUC-10 Watershed. Includes potential overlapping impacts from sedimentation, turbidity, and water quality for direct in-water work.	Based on our findings throughout the previous sections of this EIS and given the anticipated scale of impacts the Southgate Project would have on surface water resources, fish, and aquatic life, the natural, ecological boundaries of a HUC-10 watershed is the appropriate geographic scope for this analysis.
Cultural Resources	Overlapping impacts within the APE	The APE for direct effects (physical) includes areas subject to ground disturbance, while the APE for indirect effects (visual or audible) includes aboveground ancillary facilities or other Southgate Project elements that are visible from historic properties in which the setting contributes to their NRHP eligibility.

TABLE 4.13-1

Geographic Scope for Cumulative Impact Analysis

Resource(s)[1]	Cumulative Impact Geographic Scope	Justification for Geographic Scope
Land Use	1-mile radius	Impacts on general land uses would be restricted to the construction workspaces and the immediate surrounding vicinity; therefore, the geographic scope for land use and recreation is a 1.0-mile radius from the centerline of the Southgate Project pipeline and aboveground facility sites.
Visual	Viewshed: Includes distance that the tallest feature at the planned facility would be visible from neighboring communities for aboveground facilities. For pipelines, a distance of 0.25 mile and existing visual access points (e.g., road crossings).	Assessing the impact based on the viewshed allows for the impact to be considered with any other feature that could have an effect on aesthetic quality.
Noise - Operations	NSAs located within 1 mile of the Southgate Project's noise-emitting permanent aboveground facilities.	Noise from the Southgate Project's permanent facilities is not anticipated to have an impact beyond 1.0 mile.
Noise - Construction	0.25 mile from pipeline or aboveground facilities. 0.5 mile from HDD installation	Areas in the immediate proximity of pipeline or aboveground facility construction activities (within 0.25 mile) would have the potential to be affected by construction noise. NSAs within 0.5 mile of an HDD installation could be cumulatively affected if other projects had a concurrent impact on the NSA.
Air Quality - Operations	50 km (about 31.1 miles) from compressor station	The geographic scope adopted the distance used by the EPA for cumulative modeling of large PSD sources during permitting and following 40 CFR 51, appendix W, section 4.1. We consider 50 km a conservative geographic scope for the purpose of identifying other projects which could contribute to a cumulative impact on air quality.
Air Quality - Construction	0.25 mile from pipeline or aboveground facilities	Air emissions during construction would be limited to vehicle and construction equipment emissions and dust, and would be localized to the Southgate Project construction sites. About 0.25 mile conservatively captures the distance these emissions would travel before becoming negligible and unlikely to contribute to a cumulative impact.

TABLE 4.13-1

Geographic Scope for Cumulative Impact Analysis

Resource(s)[1]	Cumulative Impact Geographic Scope	Justification for Geographic Scope
Socioeconomics	Affected counties and municipalities	Affected counties would experience the greatest impacts associated with employment, housing, public services, transportation, traffic, property values, economy, and taxes.
Environmental Justice	Census tracts that contain or are adjacent to Southgate Project facilities	Projects within the census tracts directly affected by and adjacent to the proposed Southgate Project facilities could contribute to cumulative impacts on Environmental Justice communities.

The Southgate Project would affect 9 HUC-10 watersheds and 21 HUC-12 watersheds during construction. These watersheds vary in size depending on topography. The average size of the affected HUC-10 watersheds is about 130,000 acres, while the average size of the HUC-12 watersheds is approximately 19,000 acres. The total area included in our consideration of cumulative impacts on these resources covers more than 1 million acres. Tables 4.13-2 and 4.13-3 list all the HUC-10 and HUC-12 watersheds affected during construction and operation of the Southgate Project, their size in acres, the acres affected by other projects considered in this analysis within each watershed, and the acres affected by the Southgate Project within each watershed.

TABLE 4.13-2

HUC-10 Watersheds Affected by the Southgate Project and Other Projects

Activity	Construction (Acres) b/	Percent of Watershed c/
VIRGINIA (HUC-10 WATERSHED ACRES)		
Watershed: Cherrystone Creek-Banister River (88,668 acres)		
Other Identified Projects a/	246.9	0.3
Southgate pipeline and Associated Facilities	243.9	0.3
Watershed: Wolf Island Creek-Dan River (97,896 acres)		
Other Identified Projects a/	11.7	<0.1
Southgate pipeline and Associated Facilities	153.2	0.2
Watershed: Stinking River-Banister River (148,877 acres)		
Other Identified Projects a/	177.2	0.1
Southgate pipeline and Associated Facilities	11.0	<0.1
VIRGINIA/NORTH CAROLINA (HUC-10 WATERSHED ACRES)		
Watershed: Cascade Creek – Dan River (133,602 acres)		
Other Identified Projects a/	151.0	0.1
Southgate pipeline and Associated Facilities	367.3	0.3
Watershed: Hogans Creek-Dan River (128,257 acres)		
Other Identified Projects a/	112.0	<0.1
Southgate pipeline and Associated Facilities	176.2	0.1
NORTH CAROLINA (HUC-10 WATERSHED ACRES)		
Watershed: Headwaters Haw River (120,672 acres)		
Other Identified Projects a/	787.0	0.7
Southgate pipeline and Associated Facilities	136.4	0.1
Watershed: Back Creek-Haw River (160,351 acres)		
Other Identified Projects a/	493.0	0.3
Southgate pipeline and Associated Facilities	284.7	0.2
Watershed: Big Alamance Creek (167,770 acres)		
Other Identified Projects a/	47.0	<0.1

TABLE 4.13-2

HUC-10 Watersheds Affected by the Southgate Project and Other Projects

Activity	Construction (Acres) b/	Percent of Watershed c/
Southgate pipeline and Associated Facilities	4.6	<0.1
Watershed: Lower Smith River (148,578 acres)		
Other Identified Projects **a/**	0	0
Southgate pipeline and Associated Facilities	5.3	<0.1
Other Identified Projects Total	**2,025.8**	**0.2**
Southgate pipeline and Associated Facilities Total	**1,382.7**	**0.1**

a/ Includes estimated values.

b/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Southgate Project.

c/ Percent of watershed affected is based on the acres of the HUC-10 watershed in the applicable state, and the construction acres for the Southgate Project and the other relevant projects within the applicable HUC-10 watershed.

TABLE 4.13-3

HUC-12 Watersheds Affected by the Southgate Project and Other Projects

Activity	Construction (Acres) b/	Percent of Watershed c/
VIRGINIA (HUC-12 WATERSHED ACRES)		
Watershed: Cane Creek-Dan River (14,462 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	26.1	0.2
Watershed: Cherrystone Creek (29,132 acres)		
Other Identified Projects a/	246.9	0.8
Southgate pipeline and Associated Facilities	105.3	0.4
Watershed: Lower Sandy River (34,709 acres)		
Other Identified Projects a/	10.0	0.0
Southgate pipeline and Associated Facilities	83.4	0.2
Watershed: Sandy Creek (West)-Dan River (20,670 acres)		
Other Identified Projects a/	1.7	0.0
Southgate pipeline and Associated Facilities	69.8	0.3
Watershed: Shockoe Creek-Banister River (18,805 acres)		
Other Identified Projects a/	138.2	0.7
Southgate pipeline and Associated Facilities	11.0	0.1
Watershed: White Oak Creek-Banister River (23,128 acres)		
Other Identified Projects a/	0.0	0.0

TABLE 4.13-3

HUC-12 Watersheds Affected by the Southgate Project and Other Projects

Activity	Construction (Acres) b/	Percent of Watershed c/
Southgate pipeline and Associated Facilities	138.5	0.6
VIRGINIA/NORTH CAROLINA (HUC-12 WATERSHED ACRES)		
Watershed: Trotters Creek-Dan River (27,788 acres)		
Other Identified Projects a/	133.0	0.5
Southgate pipeline and Associated Facilities	109.0	0.4
NORTH CAROLINA (HUC-12 WATERSHED ACRES)		
Watershed: Boyds Creek-Haw River (19,153 acres)		
Other Identified Projects a/	256.0	1.3
Southgate pipeline and Associated Facilities	132.0	0.7
Watershed: Cascade Creek (6,121 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	59.8	1.0
Watershed: Fall Creek-Smith River (6,739 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	5.3	0.1
Watershed: Giles Creek – Haw River (10,520 acres)		
Other Identified Projects a/	176.0	1.7
Southgate pipeline and Associated Facilities	17.5	0.2
Watershed: Lick Fork (12,923 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	46.6	0.4
Watershed: Little Troublesome Creek (8,324 acres)		
Other Identified Projects a/	30.0	0.4
Southgate pipeline and Associated Facilities	11.6	0.1
Watershed: Lower Back Creek (21,358 acres)		
Other Identified Projects a/	155.0	0.7
Southgate pipeline and Associated Facilities	6.4	<0.1
Watershed: Lower Little Alamance Creek (19,490 acres)		
Other Identified Projects a/	38.0	0.2
Southgate pipeline and Associated Facilities	4.6	<0.1
Watershed: Stony Creek-Stony Creek Reservoir (20,308 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	48.8	0.2
Watershed: Town Creek-Dan River (22,520 acres)		
Other Identified Projects a/	0.0	0.0

TABLE 4.13-3

HUC-12 Watersheds Affected by the Southgate Project and Other Projects

Activity	Construction (Acres) b/	Percent of Watershed c/
Southgate pipeline and Associated Facilities	142.5	0.6
Watershed: Town of Altamahaw-Haw River (13,013 acres)		
Other Identified Projects a/	252.0	1.9
Southgate pipeline and Associated Facilities	107.3	0.8
Watershed: Travis Creek-Haw River (22,306 acres)		
Other Identified Projects a/	40.0	0.2
Southgate pipeline and Associated Facilities	97.5	0.4
Watershed: Upper Hogans Creek (29,144 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	103.5	0.4
Watershed: Upper Wolf Island Creek (18,148 acres)		
Other Identified Projects a/	0.0	0.0
Southgate pipeline and Associated Facilities	56.0	0.3
Other Identified Projects Total	1,475.8	0.4
Southgate pipeline and Associated Facilities Total	1,382.7	0.3

a/ Includes estimated values.

b/ Construction acres includes the area affected by construction (i.e., temporary and additional temporary workspace, contractor yards, and access roads) and the area affected by operation of the Southgate Project.

c/ Percent of watershed affected is based on the acres of the HUC-12 watershed in the applicable state, and the construction acres for the Southgate Project and the other relevant projects within the applicable HUC-12 watershed.

4.13.1 Other Projects Within the Geographic Scope of Analysis

In accordance with the CEQ regulations, we identified other projects (and actions) located in the resource-specific geographic scope of the Southgate Project and evaluated the potential for a cumulative impact on the environment. These projects are described in the following sections and are depicted on maps and summarized in appendix F. Actions were identified by reviewing a variety of publicly available information, including but not limited to pending or approved permit information from federal, state, and local agencies; various organizations' websites; commercial company websites; news outlets; and desktop and field review. We have identified five types of projects that could contribute to a cumulative impact. These are:

- FERC-jurisdictional natural gas interstate transportation projects;
- non-jurisdictional Southgate Project-related facilities;
- other energy projects;
- mining operations;

- transportation or road projects; and
- commercial/residential/industrial and other development projects.

Development of other projects would likely result in permanent impacts on vegetation and associated wildlife habitat; displacement of wildlife; loss of soil and land use; alteration of surface and groundwater flow, and visual resources; as well as temporarily and/or permanently increase dust, and impact noise levels and air quality. Approximate locations of the other projects in relation to the Southgate Project are shown in figures 1 through 4 in appendix F.1. Additional details on each project are also described in appendix F.2.

Due to concerns raised during public scoping, the ACP Project (CP15-554) was considered but not included because the closest ACP Project facility is located approximately 100 miles from the Southgate Project and is outside of the defined geographic scopes considered in this analysis. As previously described, projects located outside a geographic scope are not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the Project.

4.13.1.1 FERC-jurisdictional Natural Gas Interstate Transportation Projects

There are three FERC-regulated natural gas transmission pipeline projects within proximity to the Southgate Project: Virginia Southside Expansion (CP13-30-000), Virginia Southside Expansion II (CP15-118), Southeastern Trail (CP18-186-000), and Mountain Valley Pipeline (CP16-10-000).

Virginia Southside Expansion

Transco's Virginia Southside Expansion went into service in September 2015. The project extended the Transco pipeline system from Transco Station 165 in Pittsylvania County, Virginia 98 miles to Brunswick County, Virginia through the counties of Halifax, Charlotte, and Mecklenburg. Upgrades in New Jersey, North Carolina, Maryland, and Pennsylvania were also included as part of the project. A new compressor station, Transco Station 166, was constructed in Pittsylvania County, Virginia, approximately 600 feet northeast from the boundaries of proposed Lambert Compressor Station site. The project affected a total of 1,454.3 acres during construction of which 199 acres is being maintained for operation. Approximately 51 acres of wetlands and 63.4 acres of prime farmland were affected during construction and 4.8 acres of wetlands and 10 acres of prime farmland were permanently affected by operation of the project. Construction of the Virginia Southside Expansion project disturbed approximately 160 acres of silviculture forest and 322 acres of non-silviculture forest. However, only fraction of these total acreages occurred in the geographic scopes of the Southgate Project. As shown in appendix F.2, this project is within the geographic scopes for all resources. The project affected about 18 acres within the Cherrystone Creek-Banister River HUC-10 watershed and 63.2 acres within the Stinking River-Banister River HUC-10 watershed (watersheds affected by the Southgate Project shown in table 4.13-2 above). The only ongoing impacts from this project within the Southgate Project geographic scopes are forest regeneration, air emissions and noise, socioeconomics, and visual impacts.

Virginia Southside Expansion Project II

In December 2017 Transco's Virginia Southside Expansion Project II went into service. This project included the following construction and upgrade activities:

- new 4.19-mile-long 24-inch-diameter lateral pipeline in Brunswick and Greensville Counties, Virginia, referred to as the Greensville Lateral;
- new building containing a pig launcher and a new block valve assembly at the Greensville Lateral's connection to the existing Brunswick Lateral in Brunswick County, Virginia;
- new building containing the proposed Greensville Meter and Regulator (M&R) Station, a pig receiver, heaters, and a block valve assembly at the end of the Greensville Lateral in Greensville County, Virginia;
- new 25,000 horsepower electric-driven compressor unit at CS 185 in Prince William County, Virginia;
- addition of 21,830 horsepower of gas-driven compression at CS 166 (including piping, valve modification, gas cooling, and the re-wheeling of two existing compressor units) and a 1,208 brake-horsepower emergency generator in Pittsylvania County, Virginia; and
- modifications to 19 existing facilities on Transco's existing pipeline (mainlines and the Tryon Lateral) in North Carolina and South Carolina.

The Virginia Southside Expansion Project II affected 180.1 acres of land during construction and 29.3 acres during operation. The project crossed 1.3 miles of prime farmland during construction and returned these areas to agricultural land use following construction. Approximately 0.8 acre of wetlands and 30.0 acres of forest was affected for construction; the project's operation permanently affected 0.4 acres of wetlands and 12.4 acres of forest. However, only a fraction of these total acreages occurred in the geographic scopes of the Southgate Project. This project falls within the geographic scopes for all resources as shown in appendix F.2. Approximately 27.4 acres of the Cherrystone Creek-Banister River HUC-10 watershed and 1.8 acres of the Stinking River – Banister River HUC-10 watershed were affected by construction of the Virginia Southside Expansion II Project. Impacts associated with operation of this project within the Southgate Project geographic scopes include forest regeneration, air emissions and noise, socioeconomics, and visual impacts.

Southeastern Trail

Transco filed its application for the Southeastern Trail Project (CP18-186-000) with the FERC on April 11, 2018. This project would include construction of approximately 8 miles of pipeline along the existing Transco mainline in Fauquier and Prince William Counties, Virginia between Station 180 and 185. Compressor station horsepower additions were also proposed at Stations 165, 175, and 185 in Virginia. Compressor Station 165 is located in Pittsylvania County, Virginia, less than 5 miles from the Southgate Project, and falls within the geographic scope for cumulative impacts on air quality. Only a portion of the total impacts of this project falls within the geographic scopes of the Southgate Project. This project falls within the geographic scopes for all resources as shown in appendix F.2 and could contribute to cumulative impacts on all resources. Approximately 19.2 acres of the Cherrystone Creek-Banister River HUC-10 watershed and 62.9 acres of the Stinking River – Banister River HUC-10 watershed would be affected by the Southeastern Trail Project. Transco projected an in-service date of November 1, 2020, with construction to begin August 2019.

Mountain Valley Pipeline Project

Mountain Valley filed an application with the FERC on October 23, 2015 for the Mountain Valley Pipeline Project in Docket No. CP16-10. Approximately 303 miles of 42-inch pipeline, 3 new compressor stations, and associated facilities were proposed for construction in West Virginia and Virginia. Construction for the Mountain Valley Pipeline Project began in the first quarter of 2018. The project's total construction disturbance footprint is about 6,362.5 acres, and it would affect about 2,116.5 acres when operational. Construction of the Mountain Valley Pipeline Project would affect 31 acres of wetlands and 4,453.1 acres of upland forest. Operation of the project would affect 7.9 acres of wetlands and 1,596.9 acres of upland forest. Construction and operation of the project would affect 23.5 acres of prime farmland within the Southgate Project workspace. The Mountain Valley Pipeline Project is within the geographic scopes for all resources, but only a small portion at the southern end of the project falls within Southgate Project's resource-specific geographic scopes.

There would be 182.3 acres constructed for the Mountain Valley Pipeline Project in the Cherrystone Creek-Banister River HUC-10 watershed and 49.3 acres constructed in the Stinking Rover–Banister River HUC-10 watershed. The Mountain Valley Pipeline Project and Southgate Project would cross two of the same perennial streams and one intermittent stream within the Cherrystone Creek-Banister River HUC-10 watershed. These stream crossings for each project are located at least 3.5 miles from one another and would not occur on the same timeline.

4.13.1.2 Non-jurisdictional Southgate Project-related Facilities

Non-jurisdictional facilities associated with the Southgate Project would include installation of aboveground and underground powerlines and telecommunications from existing nearby power poles to the interconnects, cathodic protection sites, and MLVs. All of the MLVs associated with the Southgate Project would require the local electric distributor to extend aboveground power and telecommunications from an existing power pole to the MLV site. These extensions would range from 50 feet to 1,684 feet in length. Impacts from these non-jurisdictional facilities are included in appendix F.2. Although these facilities fall within several of Southgate's resource-specific geographic scopes, impacts associated with these non-jurisdictional facilities are expected to be minimal due to the limited footprint of these projects and potential mitigation measures required by permitting agencies.

4.13.1.3 Other Energy Projects

Reidsville Energy Center Project

In January of 2017, NTE Energy received siting authority from the North Carolina Utilities Commission for the Reidsville Energy Center proposed to be constructed in Rockingham County starting mid- to late-2019 with a commercial operation date of October 1, 2021 with an expected final completion date of January 1, 2022. The 500 MW natural gas-fired combined cycle generating facility would be interconnected with the Duke Energy Carolinas, LLC transmission system and is proposed to be located approximately 12 miles from the Southgate Project. Approximately 20 acres of forest land would be disturbed for construction and operation of the project. As shown in appendix F.2, this project is within the geographic scope socioeconomics**.**

Solar Energy Generation Projects

We identified 13 solar generation facilities in various stages of development in Rockingham and Alamance Counties, affecting approximately 923 acres of land. Details on the solar generation facilities can be found in appendix F.2. As shown in appendix F.2, these projects are within the geographic scopes for the following resources: groundwater, surface waters, wetlands, vegetation, wildlife, air quality (operation), and socioeconomics. An estimated 897 acres are located within HUC-10 watersheds and 523 acres are located within HUC-12 watersheds affected by the Southgate Project. Development of all 13 solar facilities is likely to affect a total of approximately 385 acres of forest land within HUC-12 watersheds. The solar facilities would affect 0.9 acres of mapped Prime Farmland within the Southgate Project workspace. The Bakatsias Solar Farm, Green Level – Charles Drew Solar Farm, Husky Solar Farm, and Cypress Creek Renewables Solar Farm are located less than 1 mile from the Southgate Project and are within the geographic scopes for the following resources, in addition to the resources previously mentioned: cultural resources, land use, recreation, visual resources, noise (construction and operation), and air quality (construction). The Old Road Solar Farm, Kimery Road Solar Farm, and Necal Solar Farm are located within the geographic scope for Environmental Justice communities, described in section 4.13.2.7.

Both the Cypress Creek Renewables Solar Farm and the Husky Solar Farm are located directly adjacent to the existing Transco right-of-way between MP 48.7 to 51. Construction on the Cypress Creek Renewables Solar Farm is anticipated to begin in the summer or fall of 2019 with project operation commencing in 2020. The project would include construction of an 80 MW facility between MP 49 and 51 on 341 acres of land shared with the Headwaters Haw River HUC-10 watershed. An estimated total of 229 acres of upland forest would be affected by this project. About 0.4 acres of prime farmland within the Southgate Project workspace would be affected by construction and operation of the Cypress Creek Renewables Solar Farm. The 7 MW Husky Solar Farm is located between MP 48.7 and 49.0, occupying space on both sides of NC Highway 87, and is currently in operation. This facility occupies 29 acres of land within the Headwaters Haw River HUC-10 watershed and affects 0.5 acres of prime farmland within the Southgate Project workspace.

The Husky Solar Farm and Bakatsias Solar Farm are both in operation. Ongoing impacts from these projects within the Southgate Project geographic scopes include forest regeneration, prime farmlands soils (Husky Solar Farm only), socioeconomics, and visual impacts.

4.13.1.4 Mining Operations

We identified 22 facilities, including quarries, mines, pits, and a brick plant, through the USGS Mineral Resources Data System located within 7 shared HUC-10 watersheds. The East Alamance Quarry is the only active mining operation located within 0.25 miles of the Southgate Project as listed in appendix F.2 and described in section 4.1.2.

Ongoing activities at these facilities could affect an estimated 6,540 acres within the geographic scopes of the Southgate Project. Operating these facilities requires surface clearing, excavation, mineral extraction, and reclamation in accordance with state or local permit requirements. Activities at these facilities are presently ongoing and affect different sites and acreages as resource-extraction activities change over time. Resource-extraction operations requires land to be disturbed, which could result in impacts on water resources, vegetation, air quality, and noise. Depending on the facility operator (and the resources present), we expect future activities to occur incrementally. No significant cumulative impacts are anticipated from these facilities as operational activities would be subject to state and local permit requirements, such as erosion and sediment control plans.

4.13.1.5 Transportation and Road Improvement Projects

The Virginia Department of Transportation (VADOT) and North Carolina Department of Transportation (NCDOT) are overseeing nine infrastructure projects in the range of geographic scopes for the proposed Southgate Project. These include widening of local routes, bridge replacement, and other road improvements and treatment projects.

According to available information, the size of many of the transportation and road improvement projects identified is less than 20 acres. All of the projects were considered minor, as they were generally localized road improvements rather than larger road projects encompassing many miles. Construction timeframes for eight of the transportation and road improvement projects are currently unknown. The remaining transportation and road improvement project in the Southgate Project geographic scope, U.S. Route 29 South over Norfolk Southern Railroad, was completed in 2017; therefore, no cumulative impacts on resources within the Southgate Project geographic scope are anticipated.

4.13.1.6 Commercial, Industrial, and Residential Projects

There are seven commercial, industrial, and residential development projects that have been identified within the watersheds used in our analysis. From the available data we gathered, these projects may impact 421 acres of land within HUC-10 watersheds and 309 acres within HUC-12 watersheds affected by the Southgate Project, including 38.5 acres of upland forest. Each of these developments would likely be completed by the time the Southgate Project would be under construction; however, mixed-use portions of the Granite Mill Project may be constructed in 2021 and 2022. Mountain Valley would coordinate with developers of the Granite Mill Project if construction schedules were to coincide with the Southgate Project.

Due to the speculative nature of the housing and development markets and funding mechanisms for other projects listed in appendix F.2, 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 the Southgate Project. Based on the largely temporary impacts associated with the Southgate Project, we have determined that impacts associated with the Southgate Project when assessed with the other commercial, industrial, and residential projects would not result in a significant cumulative impact.

4.13.2 Cumulative Impacts on Specific Environmental Resources

Data for specific environmental resources were identified by reviewing a variety of publicly available information, as discussed in the introduction. In some instances, resource-specific impact data in the geographic scopes of analysis were lacking for projects, including for FERC-regulated projects. For these circumstances we either used Project-specific data to estimate quantitative resource impacts using scaling and assumptions, or have noted where information is unavailable where appropriate. Therefore, conclusions regarding cumulative impacts on specific environmental resources are limited only to available data on other projects and the contribution of the Southgate Project to potential resource impacts.

4.13.2.1 Soils

With the exception of prime farmland soils, we determined that the Southgate Project when considered with other projects would not have cumulative impacts on all other types of soils because of the site-specific nature of the soils crossed and the fact that implementation of FERC's Plan would keep soils within the construction right-of-way. As previously mentioned, three projects would overlap with the Southgate Project's workspace: the Mountain Valley Pipeline Project, Cypress Creek Renewables Solar Farm, and the Husky Solar Farm. The Husky Solar Farm is in operation, therefore no construction activities would occur within the same timeframe as the Southgate Project. Construction activities for both the Mountain Valley Pipeline Project and Cypress Creek Renewables Solar Farm are planned for 2019. It is unknown whether construction activities for these two projects would extend into 2020 or coincide with the Southgate Project. FERC requires the project proponents to follow the FERC Plan to keep soils in the construction right-of-way and fully restore soils to pre-construction condition immediately after construction. We assume other non-FERC-regulated projects would follow similar requirements set by the permitting agencies. Therefore, although soils would be temporarily disturbed from the combination of these projects occurring within similar timeframes and adjacent workspaces, ultimately, after project completion and restoration there would not be any discernable cumulative impact on soils.

Construction and operation of projects within the geographic scope for soils (Southgate Project construction workspace) would cumulatively affect 24.4 acres of prime farmland soils. Approximately 23.5 acres of prime farmland soils would be affected by the Mountain Valley Pipeline Project, 0.4 acres would be affected by the Cypress Creek Renewables Solar Farm, and 0.5 acres are affected by the Husky Solar Farm.

As a FERC-regulated project, the Mountain Valley Pipeline Project would be required to return soils and agricultural land in temporary workspaces and the pipeline right-of-way to pre-construction conditions. These areas would be able to be farmed after restoration is complete. We assume that the 0.9 acres of prime farmland affected by the Cypress Creek Renewables Solar Farm, and Husky Solar Farm would also be required to return these areas to pre-construction conditions, unless there is a permanent aboveground facility or access road located in the area. Due to impacts being temporary on prime farmland soils for most projects in the area, we conclude that a small but not significant cumulative impact on these resources would occur.

4.13.2.2 Water Resources

The cumulative impact geographic scope for water resources varies according to the water source. As stated in table 4.13-1, we consider the HUC-12 watershed as the geographic scope for groundwater. Projects could contribute to impacts on groundwater quality within a HUC-12 sub basin due to the fact that shallow groundwater features generally follow natural drainage boundaries. We determined that the larger HUC-10 watershed was appropriate to analyze cumulative impacts on surface water resources based on our findings throughout the previous sections of this EIS and given the anticipated scale of impacts the Southgate Project would have on surface water resources.

Other projects within the affected HUC-10 watersheds include 4 FERC-jurisdictional natural gas projects, 4 non-jurisdictional facilities associated with the Southgate Project, 13 non-natural gas energy projects, 1 resource-extraction projects, 9 transportation projects, 2 commercial/industrial projects, and 5 residential projects. Other projects within the affected HUC-12 watersheds include the same FERC-jurisdictional and non-jurisdictional facilities and residential projects. A smaller number (7) non-natural gas energy projects, 7 transportation projects, 1 commercial/industrial projects, and 1 resource-extraction projects fall within the HUC-12 watersheds..

Groundwater

Water wells and springs in the vicinity of the Southgate Project are described in section 4.3.1.3. We were unable to quantitatively determine the number of these features on a HUC-12 watershed basis. 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, in general it is unlikely that pipeline activities would negatively affect groundwater supplies from wells. Springs may be more subject to disruption as there is greater connectivity at the ground surface.

The 28 other projects listed in appendix F.2 located in the affected HUC-12 watersheds would disturb surface conditions and could result in minor effects on groundwater resources. There could be a cumulative impact if multiple projects affected the same groundwater source (aquifer, well, or spring) through spills of hazardous substances or temporary increased turbidity from trench dewatering; however, it is unlikely that impacts would be significant because most projects would involve shallow ground disturbance and proponents would be required to implement spill prevention and immediate remediation plans if a spill of hazardous substances were to occur. There are no known wells or springs near the areas where there are overlapping impacts from multiple projects within the Southgate Project workspace (Mountain Valley Pipeline Project, Cypress Creek Renewables Solar Farm, and the Husky Solar Farm).

Surface Water

The Southgate Project would cross 128 perennially flowing waterbodies in Virginia and North Carolina. Details on the Southgate Project’s crossing procedures and impacts on waterbodies are discussed in section 2.4.1.10. Table 4.13-4 provides details on the number of waterbodies crossed by the Southgate Project and other projects within affected HUC-10 watersheds.

TABLE 4.13-4

Waterbodies Crossed in HUC-10 Watersheds for the Southgate Project and Other Projects

	Number of Waterbodies Crossed by the Southgate Project a/				Number of Waterbodies Crossed by the Other Projects b/			
Watershed	**Ephem**	**Interm**	**Peren**	**Pond**	**Ephem**	**Interm**	**Peren**	**Pond**
Stinking River - Banister River	0	0	0	0	0	5	2	0
Cherrystone Creek-Banister River	0	13	10	1	0	11	5	0
Wolf Island Creek – Dan River	1	2	18	0	0	0	0	0
Cascade Creek – Dan River	10	19	33	0	0	0	0	0
Hogans Creek – Dan River	4	4	20	0	0	0	0	0
Headwaters Haw River	0	4	10	0	0	0	0	0
Back Creek – Haw River	8	24	22	1	0	4	1	0
Total Streams Crossed	**24**	**76**	**128**	**2**	**0**	**20**	**8**	**0**

a/ Field delineated streams through January 22, 2019 crossed by the Southgate Project pipelines.

b/ Mapping included in the FERC eLibrary, available aerial imagery, and the USGS National Hydrography Dataset, were used to determine number of stream crossings for other projects in HUC-10 watersheds within the geographic scope of the Southgate Project

Abbreviations:

Ephem = Ephemeral

Interm = Intermittent

Peren = Perennial

Minor cumulative impacts on surface waters are possible when considering the total contributions of all 37 projects located within the affected HUC-10 watersheds. In-stream activities, such as dredging, open-cut pipeline crossing techniques, and other in-stream activities have the greatest potential to contribute to cumulative impacts on surface water resources through increased turbidity. These impacts are typically minor due to the short duration of in-water activities. Turbidity plumes may travel downstream for a few miles, but typically the plume would disperse and become diluted to background levels within several days. Projects involving in-water work would have to occur within similar timeframes within close distance to have a cumulative effect on turbidity within the waterbody or watershed. Clearing, grading, or other earthwork within the watershed may also increase the potential for cumulative impacts on water quality from increased stormwater runoff and sedimentation. Because FERC projects and most other projects would be required (by permit) to install erosion and stormwater control devices to minimize runoff, any cumulative impacts from upland construction of multiple projects occurring with a watershed would not likely be significant.

The Mountain Valley Pipeline Project would cross two of the same waterbodies as the Southgate Project; however, the crossing locations are different, at least 3.5 miles apart and there would be no overlapping workspace between the projects. In addition, the stream crossings would not occur within the same time frame due to the construction schedules for both projects. Therefore, it is unlikely that cumulative impacts would be significant because the geographic and temporal separation of the crossings would limit the potential additive impacts from turbidity. Sedimentation impacts could be additive, if turbidity plumes settled within common stream segments. Given the spatial separation of the projects, this is unlikely.

The Southgate Project would contribute little to the long-term cumulative impacts on waterbodies because the majority of the potential impacts are short-term. Each of the 37 projects within the HUC-10 watershed, such as FERC-jurisdictional, solar energy, and transportation projects, would likely have similar impacts on surface waters due to increased turbidity and sedimentation during construction. These projects would likely be required to install and maintain BMPs similar to those proposed for the Southgate Project as required by federal, state, and local permitting requirements so as to minimize impacts on waterbodies. In addition, any projects crossing Waters of the United States would have to obtain permits from the COE. Therefore, the cumulative effect on surface waterbody resources would be minor.

4.13.2.3 Wetlands

As stated in table 4.13-1, potential cumulative impacts on wetlands are evaluated within the HUC-12 watershed as projects could contribute to impacts on wetlands within the natural boundaries of a drainage basin. As described section 4.13.2.2, the Southgate Project would affect 21 HUC-12 watersheds during project construction. Of the projects listed in appendix F.2, 28 would occur within the affected HUC-12 watersheds.

Construction of the Southgate Project would affect approximately 26.8 acres of wetlands during construction and about 5.9 acres of wetlands during operation. About 4.6 acres of PFO wetlands and 0.2 acres of PSS wetlands would be affected over the long-term. About 4.4 acres of forested wetland would be converted to emergent and scrub-shrub conditions.

The Mountain Valley Pipeline Project would affect 0.7 acres of PFO wetlands and 0.1 acres of PEM wetlands within HUC-12 watersheds. None of the other FERC-jurisdictional projects would affect wetlands within HUC-12 watersheds shared with the Southgate Project. For other projects located in the geographic scope of the Southgate Project we found no wetlands would be affected or have been affected within HUC-12 watersheds or data was unavailable. For most projects where data was unavailable, only a portion of these impacts would occur in the watersheds affected by the Southgate Project.

All FERC-jurisdictional projects would comply with COE 404 permit requirements regarding potential wetland impacts and mitigation. Given the relatively small total of wetland acres affected by the Southgate Project, and information available on other projects listed in appendix F.2, we conclude that cumulative impacts on wetlands within the HUC-12 watersheds when considered with the projects identified in this analysis would not likely be significant.

4.13.2.4 Vegetation

Similar to wetlands, the geographic scope for vegetation is the HUC-12 watershed. There are 28 projects located within the HUC-12 watersheds affected by the Southgate Project, which could contribute to impacts on vegetation. Constructing the Southgate Project would impact 1,318.9 acres of vegetated lands. Details about specific vegetation types affected by the Southgate Project are provided in section 4.5.4.

Although we do not have exact data on vegetation impacts for the other projects within the geographic scope, the overall impact (disturbance footprint) data for the 28 other projects located within the affected watersheds may be used as a proxy for vegetation impacts. The other 28 projects account for 1,475.8 acres, or 0.4 percent of the HUC-12 watersheds affected by the Southgate Project as shown in table 4.13-5. Projects with permanent aboveground facilities (such as industrial developments), solar energy projects, and roads would have greater impacts on vegetation than buried utilities, which allow for restoration of vegetation following construction. However, these projects would also likely be required to implement 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.

With the exception of forest clearing, most impacts on vegetation from construction of the Southgate Project would be short-term. In general, we do not anticipate long-term cumulative impacts on upland herbaceous/scrub-shrub areas as most vegetative cover would regenerate within 1 to 3 years. Therefore, we focused our analysis more on the potential for cumulative forest impacts.

Approximately 54 percent of the Southgate Project is collocated with existing right-of-way; however, construction of the Southgate Project would result in the clearing of about 52.6 acres of interior forest and 578 acres of forested edge. In general, from the data we were able to obtain, about 447.7 acres of forest has been affected or would be affected by the projects in the geographic scope of the Southgate Project.

TABLE 4.13-5

Upland Forest/Woodland Within HUC-12 Watersheds Affected by the Southgate Project and Other Projects

Project	Acres a/
Virginia Southside Expansion	20
Virginia Southside Expansion Project II	0.6
Southeastern Trail	7
Mountain Valley Pipeline	88.7
Woodgriff Solar Farm	10
Cypress Creek Renewables Solar Farm	229
Husky Solar Farm	0
Green Level-Charles Drew Solar Energy Farm	5
Osceola Solar Project	16
Bakatsais Solar Farm	8.4
Norris Solar Farm	21.5
Route 58 over Route 311	0
Stony Mill Road	0
Mount Cross Road	0
Berry Hill Industrial Park	0
Carter Ridge Residential	3.5
LGI Homes Bedford Hills Residential	28
Forest Creek Residential	5
Brassfield Meadows Residential	5
Granite Mill Residential	0
East Alamance Quarry	0
Other Identified Projects Total a/	447.7
Southgate pipeline and Associated Facilities Total	619.3

a/ Includes estimated acreages of upload forest/woodland area within shared HUC-12 watersheds where data is available.

Constructing the Southgate Project, would create a new, cleared corridor in areas of interior forest where the rights-of-way would not be collocated with existing linear corridors. These activities, in conjunction with other projects that have permanent maintained areas within the geographic scope, would create permanent, long-term cumulative impacts on interior forest areas. Forested areas within the other project facility footprints would remain cleared for the lifetime of the facility, while other areas cleared for temporary workspaces would take 20 to 50 years or more to recover. Clearing and fragmentation of interior forests creates more edge habitat and smaller forested tracts.

Cumulative impacts on vegetation resulting from nearby projects considered along with the Southgate Project are expected to be minor, considering the limited area affected within the geographic scope, as compared to the large amount of similar communities remaining in each watershed (see table 4.13-5). The Southgate Project would restore areas of temporary impact in accordance with the FERC Plan and minimize the potential introduction of non-native invasive species through their Invasive Species Plan. Some of the other 28 projects located within HUC-12 watersheds could be required to develop similar plans to restore areas and minimize the spread of invasive plant species. For these reasons and based on the available data in our analysis, we conclude that the cumulative effect on vegetation would not likely be significant.

4.13.2.5 Wildlife, Fisheries, and Federally Listed Threatened or Endangered Species

Similar to vegetation, the HUC-12 watershed is the geographic scope of analysis for cumulative impacts on wildlife and federally listed threatened or endangered species where we determined that natural drainage basins are appropriate biological boundaries to assess potential cumulative impacts. Cumulative impacts on fisheries were assessed within the larger HUC-10 watershed for reasons described for surface water sources in section 4.13.2.2.

Wildlife

Constructing and operating the Southgate Project, as well as any of the 28 projects located in the affected HUC-12 watersheds, would temporarily increase the rates of stress, injury, and mortality experienced by wildlife. Wildlife would avoid construction activities by using adjacent habitats, but are expected to resume use of affected lands following construction and restoration. The construction of Southgate Project aboveground facilities as described in appendix F.2 would result in the permanent loss of habitat. However, this is not a large impact, as the Southgate Project would affect 13.3 acres total of vegetated habitat occupied operationally for aboveground facilities.

As discussed previously, constructing the Southgate Project would result in habitat fragmentation and "edge" effects. However we conclude that impacts on most non-special status wildlife species would not result in long-term or significant population-level effects, given the stability of local populations and the abundance of available adjacent habitat.

The construction of 28 other projects located in HUC-12 watersheds within the geographic scope of the Southgate Project would result in similar cumulative fragmentation and removal of habitat. While exact schedules are not known, we anticipate some of the other projects construction activities would occur within the same time frame as the Southgate Project. These include Southeastern Trail and the Granite Mill residential project. Operations at the East Alamance Quarry are expected to continue to operate during construction of the Southgate Project.

Cumulative impacts on wildlife as a result of increased noise, lighting, road traffic, and general human activity, would be greatest during concurrent construction of the Southgate Project and other projects. Quantitative cumulative noise impacts are further discussed in section 4.13.2.9. While noise contributions from the Southgate Project would not directly affect wildlife beyond the geographic scope for cumulative noise impacts, an overall increase in noise associated with projects located throughout the HUC-12 watershed could limit the available habitat not affected by noise to which disturbed wildlife can relocate. Wildlife that cannot relocate away from noise-emitting sources could be adversely affected by increasing stress levels and masking auditory cues necessary to avoid predation or hunt prey and find mates.

The overall footprint of the other identified projects within the defined geographic scope when combined with the Southgate Project would result in the disturbance of wildlife habitat that would either be converted to industrial use or revegetate over time. However, there are just under 400,000 acres of land area, much of which provides habitat for wildlife, within the HUC-12 watersheds comprising our geographic scope, and only about 0.3 percent of that area would be disturbed by the Southgate Project**.** Herbaceous vegetation and adjacent edge areas provide habitat for numerous wildlife species more suited to human-caused modifications. This suite of species would utilize the habitats converted from forested areas that formerly may have been inhabited by certain forest-dwelling migratory bird species. In general, most of the wildlife inhabiting the affected watersheds are human commensal species or individuals that have otherwise become acclimated to human activity.

Overall, cumulative impacts on wildlife would be greatest during the concurrent construction of the other projects considered, and would continue to a lesser extent during operation. Given the large amount of wildlife habitat that would remain undisturbed within the geographic scope, we conclude that any resulting cumulative impacts on wildlife from the combined projects occurring in the common HUC-12 watersheds would not be significant.

Fisheries and Aquatic Resources

Cumulative impacts on aquatic life was assessed using HUC-10 watersheds for the same reasons we stated for surface water resources. Potential cumulative impacts on fisheries and aquatic resources resulting from the Southgate Project and the projects in the affected HUC-10 watersheds identified in appendix F.2 include aquatic habitat alteration, spills and releases of hazardous materials into waterways, water depletions, and entrainment or entrapment of aquatic wildlife due to water withdrawals or construction crossing operations. As described in section 4.3.2.2, constructing, and operating the Southgate Project would require 227 waterbody crossings, many of which provide aquatic habitat and support fisheries. In addition, the Southgate Project would cross 21 perennial waterbodies containing fisheries of special concern; 8 in Virginia, and 13 in North Carolina. The 37 other projects in the affected HUC-10 watersheds would cross multiple waterbodies as shown in table 4.13-4. We assume that these waterbodies contain fisheries and aquatic resources. As discussed in section 4.13.2.2, only the Mountain Valley Pipeline Project would cross two of the same waterbodies as the Southgate Project; however the crossing locations are different and there would be no overlapping workspace between the Mountain Valley Pipeline Project and the Southgate Project.

Cumulative impacts on fisheries and aquatic resources could occur if other projects occur within the same segment of a waterbody and/or have similar construction time frames as the proposed Southgate Project. Additionally, cumulative impacts could occur could result where permanent or long-term impact on the same or similar habitat types occurs. We expect that most of the projects in the geographic scope that are subject to permitting approval would be designed to minimize impacts on fisheries and aquatic resources and that the VADEQ and NCDEQ would require any other projects to adhere to state-mandated or recommended timing windows for construction within waterbodies containing sensitive fish species. However, until permits and authorizations are finalized, the extent of avoidance, minimization, and mitigation is speculative and we have not used this information to determine significance.

Impacts on fisheries and aquatic resources would be temporary and mostly limited to construction activities associated with the other 37 projects located within HUC-10 watersheds. As such, none of these impacts are expected to be cumulatively significant because of their limited scope and temporary nature.

Federally Listed Threatened and Endangered Species

Effects on federally listed wildlife and aquatic species could occur where other projects would result in permanent or long-term loss of habitat types important to wildlife. These include transportation projects, residential development projects, and solar projects located in HUC-12 watersheds as listed in appendix F.2.

Section 7 of the ESA specifically requires "major federal actions" to have separate ESA consultations, so the impacts on all federally listed and proposed species within the geographic scope of the identified projects would be assessed. Further, because protection of threatened, endangered, and other special status species is part of the various state permitting processes or resource reviews, 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. Other companies who have constructed, are constructing, or are proposing other projects are required to consult with the appropriate federal, state, and local agencies to evaluate plant and animal species that may be found in the area. Additionally, they are required to identify potential impacts from construction and operation of the projects to any special status species identified, and implement measures to avoid, minimize, or mitigate impacts on those species.

Consultation with the FWS, pursuant to section 7 of the ESA, is ongoing. We expect all other activities (federal, state, and private) would comply with the ESA, thereby also preventing or appropriately minimizing or mitigating for impacts. Consequently, we conclude that projects in the geographic scope in combination with the Southgate Project could have minor cumulative effects on special status species, including federally listed threatened and endangered species.

4.13.2.6 Land Use, Recreation, Special Interest Areas, and Aesthetic Quality

Impacts on general land uses would be restricted to the construction workspaces and the immediate surrounding vicinity; therefore, the geographic scope for land use and recreation is a 1-mile radius from the centerline of the Southgate Project pipeline and aboveground facility sites. The cumulative impact geographic scope for aesthetics includes the viewshed or distance that the tallest feature at the planned facility would be visible from neighboring communities for aboveground facilities. For pipelines, this is typically a distance of 0.25 mile and existing visual access points.

Construction of the Southgate Project would disturb about 1,382 acres of land affecting a variety of land uses as discussed in section 4.8. Approximately 452 acres would remain in use for Southgate Project operations. The projects listed in appendix F.2 would disturb a total of approximately 10,071 acres of land affecting a variety of land uses, but only 873.03 acres is within the 1-mile geographic scope of analysis for land use impacts. All of the projects within a 1-mile radius of the Southgate Project have the potential to contribute to cumulative impacts on land use.

This includes all 4 FERC-jurisdictional projects, 4 non-jurisdictional facilities, 1 resource-extraction operations, 2 transportation projects, 1 industrial project, 1 residential/commercial project, and 4 solar projects. Projects with permanent aboveground components (e.g., buildings), solar energy projects, transportation projects, and industrial/commercial projects would generally have greater impacts on land use than the operational impacts of a pipeline, which would be buried and thus allow for most uses of the land following construction.

Some lands near the Southgate Project site are largely undeveloped, providing a variety of recreational activities. Special interest and other recreation areas crossed by the Southgate Project are discussed in section 4.8.4. None of the projects listed in appendix F.2 are located within a 1-mile radius of these areas; therefore, no cumulative impacts on special interest and recreational areas are anticipated.

Visual Setting

Aboveground facilities associated with the Southgate Project, including the Lambert Compressor Station and meter stations, would have the most impact on a visual setting. Other projects located within 0.25 mile of the Southgate Project include the Virginia Southside Expansion, Virginia Southside Expansion II, Mountain Valley Pipeline Project, Berry Hill Road project, Cypress Creek Renewables Solar Farm, Husky Solar Farm, the Granite Mill Project, East Alamance Quarry, and all 4 non-jurisdictional facilities associated with the Southgate Project. Within this context, the two solar projects would have the greatest cumulative impact on visual resources. Whereas visual impacts may be locally noticed, generally they would not be inconsistent with the existing visual character of the area. In many cases, views of the facilities and pipeline right-of-way against the landscape background are from highways, with viewers located in moving vehicles, reducing the time of the view. Those views may also be shielded by topography, perspective (angled crossings would typically be less visible than perpendicular crossings), and vegetation. The Lambert Compressor Station has been sited adjacent to an existing industrial area and would be screened from view from the nearest public roadway through graded terrain and existing wooded vegetation.

Transco Compressor Station 165 is located approximately 0.62 mile (1 km) from the Lambert Compressor Station in an adjacent industrial area. Transco Compressor Station 166 is located in the same industrial area as Transco Compressor Station 165 and is situated approximately 600 feet northeast of the Lambert Compressor Station. There are trees and vegetation in place along adjacent roadways that buffer the views from both compressor stations from passersby. The addition of the Lambert Compressor Station to the existing industrial area would not result in significant changes to the visual landscape of the area. Revegetation as required by federal and state agencies would reduce visual impacts for most projects located within 0.25 mile of the Southgate Project.

Given the reasons described above, we conclude that the Southgate Project's contribution to cumulative impacts on these land use, recreation and visual resources, when considered with the other projects included in our analysis, would not be significant.

4.13.2.7 Socioeconomics

The socioeconomic cumulative impact geographic scope for the Southgate Project includes all 3 affected counties and municipalities. A county-wide geographic scope for socioeconomics was selected because the primary economic and fiscal effects of projects are generally discernable or measurable at the county level, and the affected counties would experience the greatest impacts associated with employment, housing, public services, transportation, traffic, property values, economy, and taxes.

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. Most of the projects listed in appendix F.2 occur within the 3 counties crossed by the Southgate Project. Transco Southeastern Trail and several solar and transportation projects listed in appendix F.2 may be under construction concurrently with the Southgate Project or in the foreseeable future. Cumulative impacts on population, employment, public services, transportation and traffic would be limited to the Southgate Project construction time frame. State, county, and local economies would experience cumulative impacts from the Southgate Project and other projects during both construction and operational time frames.

It is assumed that the future projects listed in appendix F.2 would employ workers from the same labor pool in the Southgate Project counties and surrounding areas, with the exception of specialized construction crafts or trades. Given the available labor pool, we conclude that there is likely to be sufficient available labor in these counties to meet cumulative, construction and operational requirements. If construction occurs 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 in the short-term. These effects would be temporary, lasting only for the duration of construction, and there would be no long-term cumulative impact on housing.

The incremental demands of several projects taking place at the same time could strain the ability of some police, fire, and emergency service departments, particularly in rural areas. The impact would be temporary, occurring only for the duration of cumulative construction activities, 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 the Southgate Project could result in temporary impacts on road traffic in some areas and could contribute to cumulative traffic, parking, and transit impacts if other projects, such as the Cypress Creek Renewables Solar Farm and Granite Mill Project are scheduled to take place at the same time and in the same area. Increased use of local roadways from multiple projects could accelerate degradation of roadways and require early replacement of road surfaces. However, Mountain Valley, 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.

As detailed in section 4.9.7, the Southgate Project would provide an increase in tax revenue for the states, counties, and other local economies through the payment of payroll tax, sales tax, property tax, and other taxes and fees. Other present and foreseeable future projects would also be expected to contribute to a net increase in payroll and tax revenues. Therefore, we conclude that the Southgate Project, in combination with the projects listed in appendix F.2, would have both short- and long-term beneficial cumulative impacts on state, county, and local economies.

Environmental Justice

Census block groups that contain or are adjacent to Southgate Project facilities were determined to be the geographic scope for potential cumulative impacts on environmental justice communities. Figure 4.13-1 shows the locations of potential environmental justice communities within census block groups located within 1 mile of the Lambert Compressor Station, crossed by the project, and census block groups containing other relevant projects as listed in appendix F.2.

As discussed in section 4.9.8 the Southgate Project crosses two census block groups in Pittsylvania County and one census block in Rockingham County where minority populations exceed 50 percent. Additionally, low-income communities exist along the Southgate Project route within two census blocks in Pittsylvania County and six census blocks in Rockingham County. The primary impacts associated with the construction of the Southgate Project would include temporary noise, fugitive dust, and traffic during construction. Long-term effects include visual, air quality, and noise impacts from the operation of aboveground facilities. As discussed throughout this draft EIS, Mountain Valley would implement various measures to minimize impacts and, as detailed in section 4.9.8, we conclude that the Southgate Project would not have a disproportionately high and adverse environmental or socioeconomic impact on environmental justice populations

The projects listed in appendix F.2 were evaluated for potential impacts on environmental justice communities within the census tract block groups shared by and adjacent to the Southgate Project. Of the projects identified in appendix F.2, the following are located within census block groups where minority populations exceed 50 percent (or a minority population that is 10 percentage points higher than their respective county) and/or the household poverty rate is more than 20 percent (or a household poverty rate that is 10 percentage points higher than their respective county):

- **Pittsylvania County, Virginia and the city of Danville, Virginia**: Virginia Southside Expansion, Virginia Southside Expansion II, Southeastern Trail, U.S. 29 Bridge Replacement, Mount Cross Road Widening, Lambert Interconnect, Stony Mill and Tunstall High transportation project;

- **Rockingham County, North Carolina**: Old Road Solar, Carter Ridge Homes, and the T-15 Dan River Interconnect;

- **Alamance County, North Carolina**: LGI Homes Bedford Hills, Necal Solar Farm, Brassfield Meadows, and Kimery Road Solar Farm.

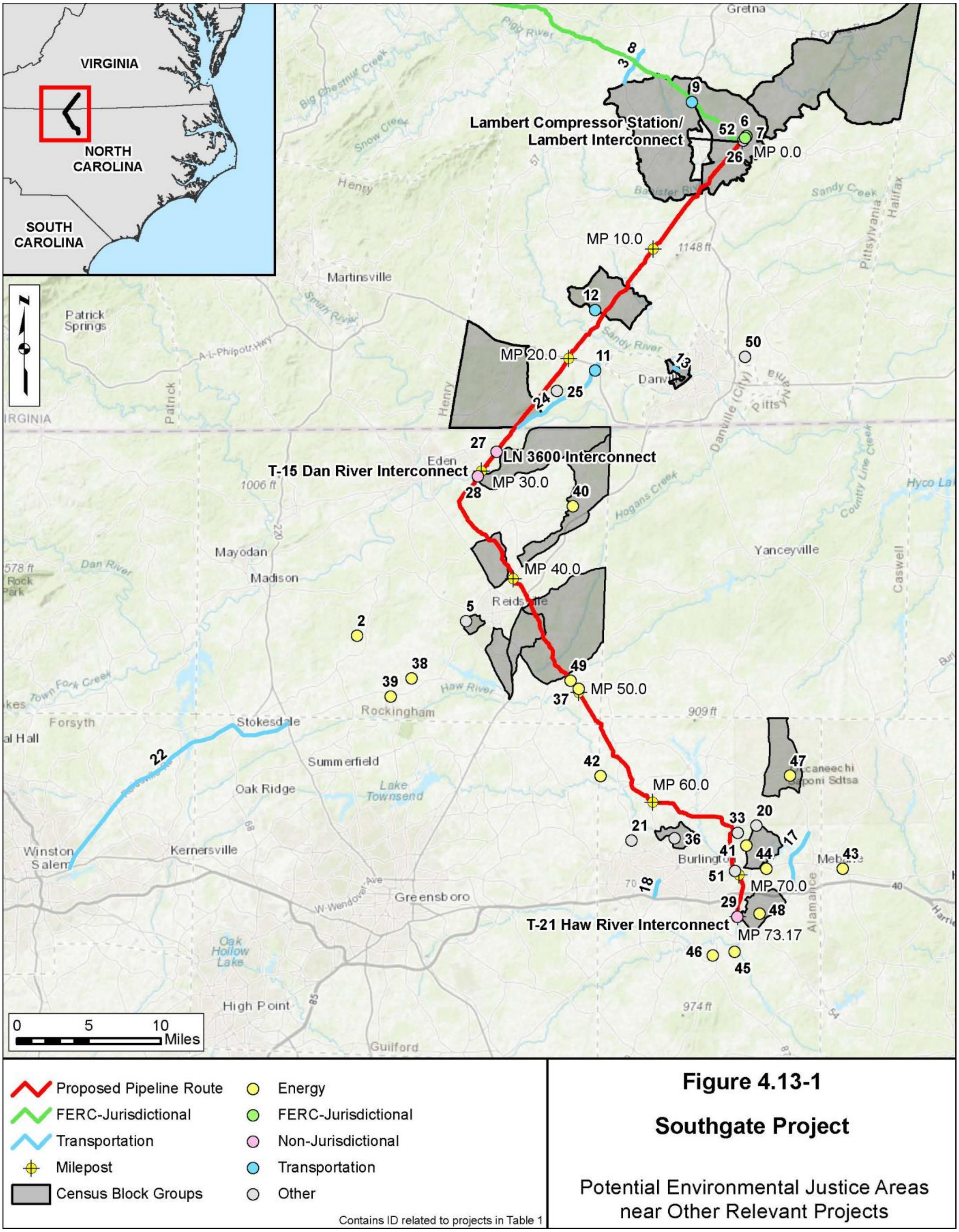

Figure 4.13-1

Southgate Project

Potential Environmental Justice Areas near Other Relevant Projects

Developers of the FERC-regulated projects listed above would be required to implement various measures to minimize impacts similar to the Southgate Project and would not have a disproportionately high and adverse environmental or socioeconomic impact on environmental justice populations. The Southeastern Trail Project would include horsepower additions to Transco Compressor Station 165, located approximately 0.62 miles from the Lambert Compressor Station. Similarly, the Virginia Southside Expansion Project II included horsepower additions to Transco Compressor Station 166, which is located approximately 600 feet northeast of the Lambert Compressor Station in the same industrial area as Transco Compressor Station 165. Both compressor stations were constructed more than 3 years ago and annual emissions from each facility are discussed in section 4.13.2.9.

As discussed below in section 4.13.2.9, no significant cumulative impacts are anticipated to surrounding communities, including environmental justice populations, based on the minor air and noise impacts associated with the Southgate Project. Upgrades to and continued operation of Transco Compressor Stations 165 and 166 would not generate emissions in exceedance of major source thresholds and would comply with all permitting requirements. As both of these facilities have been in operation for more than 3 years, emissions are considered part of the ambient background air quality and would not contribute to cumulative impacts within the Southgate Project geographic scope. Upgrades to Transco Compressor Station 165 as part of the Southeastern Trail Project would be in compliance with NAAQS and required air quality permits. Similarly, construction and operation of the Lambert Compressor Station would generate a minor impact to air quality from the additional stationary source of air emissions. However, construction and operation of the Lambert Compressor Station would also be in compliance with NAAQS and required air quality permits, therefore no disproportionate cumulative impacts on air quality on environmental justice populations are anticipated.

Potential traffic impacts associated with the transportation projects and solar projects listed above could occur during construction. The transportation projects consist of improvements to existing transportation infrastructure and are anticipated to be temporary and minor. As construction timelines for the transportation and solar projects are unknown, schedules would likely not coincide with the Southgate Project and would not contribute to cumulative traffic impacts on environmental justice populations.

Continued development of the Carter Ridge, Brassfield Meadows, and LGI Homes Bedford Hills residential projects would create temporary noise, fugitive dust, and traffic during construction; however, these impacts would be minor and temporary and would not disproportionately impact environmental justice populations.

Minor cumulative impacts on air quality and noise would likely affect environmental justice communities within the geographic scope, but these cumulative impacts would not be disproportionately significant given all projects would be required to follow standard regional and local thresholds set by permitting agencies to minimize the effects of air emissions and noise on human safety and health.

4.13.2.8 Cultural Resources

The geographic scope for potential cumulative impacts on cultural resources was limited to overlapping impacts within the APE. The direct APE for the Southgate Project was defined as a 400-foot-wide corridor centered on the pipeline; while the indirect APE would extend out 0.5-mile from the centerline.

Mountain Valley has surveyed about 91 percent of the Southgate Project pipeline routes for cultural resources by June 2019. This resulted in the identification of 65 archaeological sites and 161 historic architectural sites in the direct APE. Of the archaeological sites, 39 were evaluated as not eligible for listing in the NRHP, 10 of which extend beyond the APE and are considered unevaluated for the portions outside the APE. Additionally, there are 19 potentially eligible or unassessed sites, 3 require additional investigations before a determination of eligibility can be made, and 4 are unknown in the direct APE. Of the historic architectural sites, 118 were evaluated as not eligible for the NRHP, 7 are potentially eligible or unevaluated, 31 are unknown or have incomplete assessments, 2 should be treated as eligible, 1 is eligible, and 2 are listed in the NRHP in the direct APE.

No further work was recommended for the not eligible sites. The Southgate Project would have no effect on the ineligible resources. Avoidance or additional evaluation investigations were recommended for the potentially eligible or unevaluated sites. Avoidance or mitigation was recommended for the listed or eligible sites.

We identified 4 FERC-regulated projects, 3 non-natural gas projects, one commercial/residential project, 1 transportation project, and one mineral extraction operation within the geographic scope for cultural resources. The currently proposed projects listed in appendix F.2 that are defined as federal actions would have to comply with Section 106 of the NHPA. 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. Non-federal actions would need to comply with any mitigation measures required by the SHPOs of the affected states. 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 the Southgate Project in addition to other projects that may occur within the defined geographic scope.

4.13.2.9 Air Quality and Noise

Air Quality

Cumulative impacts on air quality associated with Southgate Project construction activities were evaluated within a geographic scope of 0.25 mile from the pipeline or aboveground facilities. Air emissions during construction would be limited to vehicle and construction equipment emissions and dust, and would be localized to the Southgate Project construction sites. A range of approximately 0.25 mile conservatively captures the distance these emissions would travel before becoming negligible and unlikely to contribute to a cumulative impact. Traditional air pollutants such as criteria pollutants, VOCs, and HAPs were listed for chronic and acute health impacts due to inhalation, as well as secondary environmental effects. For these pollutants, we can consider a geographic scope for cumulative impacts up to 31.1 miles (50 km). GHGs were identified by the EPA as pollutants in the context of climate change. GHG emission do not cause local impacts, it is the combined concentration in the atmosphere that causes global climate (see Climate Change below) and these are fundamentally global impacts that feedback to localized climate change impacts. Thus, the geographic scope for cumulative analysis of GHG emissions is global rather than local or regional. For example, a project 1 mile away emitting 1 ton of GHGs would contribute to climate change in a similar manner as a project 2,000 miles distant also emitting 1 ton of GHGs. Cumulative impacts on air quality as a result of Southgate Project operation were evaluated from a radius of 31.1 miles (50 km) from the Lambert Compressor Station..

The Southgate Project would be located in counties in Virginia and North Carolina that are in attainment/unclassifiable for all criteria pollutants. Mountain Valley would minimize potential impacts on air quality caused by construction and operation of the Project by adhering to applicable federal and state regulations to minimize emissions as described in section 4.11.

Construction

Other projects/actions within the 0.25 mile geographic scope for cumulative impacts on air quality during Southgate Project construction would involve the use of heavy equipment that would produce dust and increase traffic and resultant air emissions. Other projects within this geographic scope include Virginia Southside Expansion, Virginia Southside Expansion II, Mountain Valley Pipeline Project, Berry Hill Road Project, the 4 non-jurisdictional facilities associated with the Southgate Project, the Granite Mill Project, the Cypress Creek Renewables Solar Farm, and the Husky Solar Farm. Additionally, when completed, the projects in the geographic scope would increase air emissions through increased traffic and operation of industrial equipment. The combination of these effects would cumulatively add to the air impacts in the area.

Emissions from construction equipment would be primarily restricted to daylight hours and would be minimized through applicable equipment emission standards and by mitigation measures such as using properly maintained vehicles and commercial gasoline and diesel fuel products with specifications to control pollutants. Because the construction emissions would be short-term, intermittent, and highly localized (essentially limited to within 0.25 mile of the activity), cumulative impacts would depend on the type and location of construction activities occurring at the same time. Emissions during construction of the Lambert Compressor Station, which would be stationary (in contrast to pipeline construction which proceeds as a moving assembly line), would be temporary and would be minimized by mitigation measures described above. Ongoing activities of other projects in the area, such as non-jurisdictional Southgate Project-related facilities (see appendix F.2), also would involve the use of heavy equipment that would generate emissions of air contaminants and fugitive dust during construction.

The combined effect of multiple construction projects occurring in the same time frame as the Southgate Project could temporarily add to the ongoing air quality effects of existing activities.

However, we conclude that construction of the Southgate Project combination with other projects would not result in significant cumulative impacts on air quality.

Operation

We attempted to identify any other projects that may be located within 31.1 miles of the compressor station proposed by Mountain Valley to ensure that other nearfield facilities relevant to air quality were adequately considered. This resulted in the identification of two projects, the proposed upgrade to Transco Compressor Station 165 (20,500 hp) as part of the Southeastern Trail Project and the upgrade to Transco Compressor Station 166 (21,830 hp) as part of the Virginia Southside Expansion Project II.

Operation of both Transco Compressor Station 165 and 166 would result in long-term, stationary sources of air emissions. Operation of these facilities would generate primarily NO_x, CO, and PM emissions, with lesser amounts of SO_2 and VOCs (table 4.13-6). However, none of the major source thresholds would be exceeded, and the facilities would continue to operate in compliance with all permitting requirements, including the CAA. In addition, both facilities were constructed over 3 years ago, therefore emissions from these facilities are considered part of the ambient air quality within the Southgate Project geographic scope and are accounted for in existing facility permits. Additionally, upgrades to Transco Compressor Station 165 would be reviewed for compliance with NAAQS and required air quality permits. For these reasons, as well as the location of the facilities and typical meteorological conditions that would likely cause rapid dispersion of emissions, the cumulative impacts from operation of both FERC-regulated projects are not expected to result in a significant impact on local or regional air quality.

TABLE 4.13-6

Potential Annual Emission Rates Associated with the Southgate Project and Transco Compressor Station 165 and 166 (tons per year)

	NOx	CO	VOC	SO_2	$PM_{2.5}/PM_{10}$
Lambert Compressor Station	34.9	58.6	8.4	5.4	10.4
Transco Compressor Station 165 **a/**	182.3	207	35.4	12	23.3
Transco Compressor Station 166 **b/**	32.4	29.49	3.2	5.16E-02	2.1/3.8

a/ Source: FERC 2019
b/ Source: FERC 2016

Operation of the Southgate Project and other nearby projects would contribute cumulatively to existing air emissions. Each of the projects would need to comply with federal, state, and local air regulations, which may require controls to limit the emission of certain criteria pollutants or HAPs. For these reasons, we conclude that operation of the Southgate Project combination with other projects would not result in significant cumulative impacts on air quality.

Noise

Construction activities associated with the Southgate Project would result in perceptible noise within 0.25 mile from pipeline or aboveground facility construction activities during daylight hours, and at nearby NSAs within 0.5 mile of an HDD location. Noise from HDD operations would be temporary, but might occur around the clock at certain points in the HDD process. Noise associated with pipeline and aboveground facility construction would also be temporary, and would be mostly limited to daytime hours. This, along with our recommendation for a nighttime noise mitigation plan, would minimize the impact on nearby NSAs. The geographic scope for cumulative impacts from noise associated with project operation is limited to any facilities that could impact NSAs located within 1 mile of the Southgate Project's noise-emitting permanent aboveground facilities.

The impact of noise is highly localized and attenuates quickly as the distance from the noise source increases. Other projects located within 0.25 mile from the Southgate Project include Virginia Southside Expansion, Virginia Southside Expansion II, Mountain Valley Pipeline Project, Berry Hill Road Project, the 4 non-jurisdictional facilities associated with the Southgate Project, the Granite Mill Project, the Cypress Creek Renewables Solar Farm, and the Husky Solar Farm. The T-15 Dan River Interconnect is the only project located within 0.5 mile of an HDD location, the Stoney Creek Reservoir HDD. The nearest NSA to the T-15 Dan River Interconnect is a residence located 750 feet south from the site. Based on the schedule and proximity of the other projects to the pipeline route, there could be some cumulative noise impacts. However, the majority of noise impacts associated with the projects would be limited to the period of construction. The majority of Southgate Project construction activities would occur during daytime hours and be intermittent rather than continuous; therefore, the proposed contribution from the Southgate Project to cumulative noise impacts would primarily be for only short periods of time when the construction activities are occurring at a given location.

Operation of the Southgate Project would have a long-term effect on noise levels in proximity to the proposed Lambert Compressor Station and meter stations. Operation of the Lambert Compressor Station would not exceed our noise thresholds, nor would any of the other FERC-regulated projects. We did not identify any other stationary sources of long-term noise impacts within the geographic scope for the Lambert Compressor Station that would affect their associated NSAs. The Mountain Valley Pipeline Project would be located within 1 mile of the Lambert Compressor Station; however, no noise-emitting facilities associated with the Mountain Valley Pipeline Project would be located within one mile of the Lambert Compressor Station.

Noise from blowdown events, would be audible NSAs, but are typically infrequent, of short duration, and occur during daytime hours. Based on the analyses conducted and mitigation measures proposed, we conclude that the Southgate Project along with other projects in the geographic scope would not result in significant cumulative noise impacts on residents or the surrounding communities.

Climate Change

Climate change is the variation in climate (including temperature, precipitation, humidity, wind, and other meteorological variables) over time, whether due to natural variability, human activities, or a combination of both, and cannot be characterized by an individual event or anomalous weather pattern. For example, a severe drought or abnormally hot summer in a particular region is not a certain indication of climate change. However, a series of severe droughts or hot summers that statistically alter the trend in average precipitation or temperature over decades may indicate climate change. Recent research attributes certain extreme weather events to climate change (U.S. Global Change Research Program [USGCRP], 2017 and 2018).

The leading U.S. scientific body on climate change is the U.S. Global Change Research Program (USGCRP), composed of representatives from 13 federal departments and agencies.[42] The Global Change Research Act of 1990 requires the USGCRP to submit a report to the President and Congress no less than every 4 years that "1) integrates, evaluates, and interprets the findings of the Program; 2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and 3) analyzes current trends in global change, both human induced and natural, and projects major trends for the subsequent 25 to 100 years." These reports describe the state of the science relating to climate change and the effects of climate change on different regions of the U.S. and on various societal and environmental sectors, such as water resources, agriculture, energy use, and human health. In 2017 and 2018, the USGCRP issued its Climate Science Special Report: Fourth National Climate Assessment, Volumes I and II (Fourth Assessment Report) (USGCRP, 2017; and USGCRP, 2018, respectively). The Fourth Assessment Report states that climate change has resulted in a wide range of impacts across every region of the country. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. The U.S. and the world are warming; global sea level is rising and acidifying; and certain weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHG in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture, clearing of forests, and other natural sources. These impacts have accelerated throughout the end 20th and into the 21st century (USGCRP 2018).

Climate change is a global phenomenon; however, for this analysis, we will focus on the existing and potential cumulative climate change impacts in the Southgate Project area. The USGCRP's Fourth Assessment Report notes the following observations of environmental impacts are attributed to climate change in the Southeast region of the United States (USGCRP, 2017; USGCRP, 2018):

- The region has experienced an increase in annual average temperature of 0.46 degrees Fahrenheit (°F) since the early 20th century, with the greatest warming during the winter months;

- The region has experienced more frequent and longer heat waves and a greater number of days with nighttime temperatures above 75 °F;

[42] The USGCRP member agencies are: Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Department of Health and Human Services, Department of the Interior, Department of State, Department of Transportation, Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and U.S. Agency for International Development.

- Over the past 50 years, there has been an overall increase in extreme rainfall events in the region, except in some areas near the Appalachian Mountains and Florida where there has been a downward trend;

- The number of strong (Category 4 and 5) hurricanes has increased since the early 1980s;

- As average global sea level rise over the past century averaged approximately 8 to 9 inches; in some low lying areas of the Southeast region, the combination of vertical land motion and changing currents has resulted in as much as 1 to 3 feet of local relative sea level rise. This recent rise in local relative sea level has caused normal high tides to reach critical levels that result in flooding in many coastal areas in the region.

The USGCRP's Fourth Assessment Report notes the following projections of climate change impacts in the project region with a high or very high level of confidence[43] (USGCRP, 2018):

- The frequency and severity of extreme precipitation events are projected to increase, with up to double the number of heavy rainfall events by the end of the century.

- The Southeast region's coastal plain and inland low lying areas are projected to experience daily high tide flooding by the end of the century due to sea level rise and extreme rainfall events.

- Rising temperatures and increases in the duration and intensity of droughts are expected to increase wildfire occurrence and also reduce the effectiveness of prescribed fire.

- The region is projected to experience an increase in economic vulnerabilities in the agricultural, timber, and manufacturing sector as well as exposure-linked health impacts due to changing seasonal climates and more frequent extreme heat episodes.

- Tropical storms are projected to be fewer in number globally, but stronger in force, exacerbating the loss of barrier islands and coastal habitats.

It should be noted that while the impacts described above taken individually may be manageable for certain communities, the impacts of compound extreme events (such as simultaneous heat and drought, wildfires associated with hot and dry conditions, or flooding associated with high precipitation on top of saturated soils) can be greater than the sum of the parts (USGCRP 2018).

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[43] The report authors assessed current scientific understanding of climate change based on available scientific literature. Each "Key Finding" listed in the report is accompanied by a confidence statement indicating the consistency of evidence or the consistency of model projections. A high level of confidence results from "moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus." A very high level of confidence results from "strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus" (https://science2017.globalchange.gov/chapter/front-matter-guide/).

The GHG emissions associated with construction and operation of the Southgate Project are discussed in section 4.11.1. The construction and operation of the Southgate Project would increase the atmospheric concentration of GHGs, in combination with past, current, and future emissions from all other sources globally and contribute incrementally to future climate change impacts.

We have not been able to find any GHG emission reduction goals established at the federal level.[44] At the state level, Virginia established the "Governor's Commission on Climate Change" (GCCC) in 2007 (The Center for Climate Strategies, undated). Governor Terry McAuliffe issued Executive Order 19 on July 1, 2014 convening the Governor's Climate Change and Resiliency Update Commission. The Commission provided a report dated December 21, 2015. The Report built upon previous work and included an inventory of contributors of GHG, evaluation of impacts, approaches used by other federal or non-federal governmental agencies, needed adaptation and resilience preparations, and recommended a renewable electric portfolio percentage and actions to mitigate climate change impacts. The plan called for a reduction of GHG emissions 30% below a "business as usual scenario" by 2025. We do not have the data that identified the "business as usual" scenario. In April 2019, the VADEQ issued a final carbon trading regulation that would commence trading in 2020; however, this would only apply to electric generation units in excess of 25 MW. As the Southgate Project is intended to serve end users in North Carolina, we cannot determine Southgate Project effects, if any, on Virginia's GHG goals.

On October 29, 2018, North Carolina Governor Roy Coopers signed EO No. 80 "North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy". The EO mandated a statewide reduction of greenhouse gas emissions by 2025 to 40 percent below 2005 levels. Mountain Valley has indicated that the currently subscribed volume of natural gas, 300 MMcf/d, would be used in North Carolina, primarily by residential and small and medium-sized commercial customers for heating, cooking, and other end-uses. The remaining 75 MMcf/d could be utilized in either North Carolina or Virginia. The end use of this gas is not known. For both the subscribed and unsubscribed volumes, we cannot determine Southgate Project effects on the states' goals.

Currently, there is no universally accepted methodology to attribute discrete, quantifiable, physical effects on the environment to the Southgate Project's incremental contribution to GHGs. We have looked at atmospheric modeling used by the EPA, National Aeronautics and Space Administration, the Intergovernmental Panel on Climate Change, and others and we found that these models are not reasonable for project-level analysis for a number of reasons. For example, these global models are not suited to determine the incremental impact of individual projects, due to both scale and overwhelming complexity. We also reviewed simpler models and mathematical techniques to determine global physical effects caused by GHG emissions, such as increases in global atmospheric carbon dioxide (CO_2) concentrations, atmospheric forcing, or ocean CO_2 absorption. We could not identify a reliable, less complex model for this task and we are not aware of a tool to meaningfully attribute specific increases in global CO_2 concentrations, heat forcing, or similar global impacts on Southgate Project-specific GHG emissions. Similarly, it is not currently possible to determine localized or regional impacts from GHG emissions from the Southgate

[44] The national emissions reduction targets expressed in the EPA's Clean Power Plan and the Paris climate accord are pending repeal and withdrawal, respectively

Project. Absent such a method for relating GHG emissions to specific resource impacts, we are not able to assess potential GHG-related impacts attributable to the Southgate Project. Without the ability to determine discrete resource impacts, we are unable to determine the significance of the Southgate Project's contribution to climate change.

4.13.3 Conclusion

Construction of the Southgate Project, in addition to other projects within geographic scopes of analysis, could have minor cumulative impacts on a range of environmental resources, as discussed above. The majority of the cumulative impacts associated with the Southgate Project and with the projects listed in appendix F.2 would be minor and temporary during construction. However, some long-term cumulative impacts would occur in forested wetlands and forested uplands regarding vegetative communities and associated wildlife habitats. Some cumulative long-term benefits include new jobs and wages, purchases of goods and materials, and tax revenues. For the federal projects listed in appendix F.2, there are laws and regulations in place that protect waterbodies and wetlands, threatened and endangered species, and historic properties, and limit impacts from air and noise pollution. We only have limited information about potential or foreseeable private projects in the region. For some resources, there are also state laws and regulations that apply to private projects as listed in appendix F.2. Given the Southgate Project BMPs, design features, and mitigation measures that would be implemented; and the federal and state laws and regulations protecting resources, and permitting requirements that would apply to the other projects listed in appendix F.2, we conclude that when added to other past, present, and reasonably foreseeable future actions, cumulative impacts on environmental resources within the geographic scopes affected by the Southgate Project would not be significant.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations are based on input from the COE and the FWS, as cooperating agencies in the preparation of this draft EIS. The federal cooperating agencies may adopt this EIS per 40 CFR 1501.3 if, after an independent review of the document, they conclude that their 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 or determinations.

We conclude that construction and operation of the Southgate Project would result in limited adverse environmental impacts. Most adverse environmental impacts would be temporary or short-term during construction, but some long-term and permanent environmental impacts would occur on forest and wetlands. This determination is based on a review of the information provided by Mountain Valley and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as individual members of the public. As part of our analysis, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the Project. We are, therefore, recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. If the Project is constructed and operated in accordance with the mitigating measures discussed in this draft EIS, and our recommendations, adverse environmental impacts would be reduced to less than significant levels. A summary of the Project impacts and our conclusions regarding impacts are provided below by resource area.

5.1.1 Geologic Resources

The overall effects of Project construction and operation on topography and existing geologic conditions would be minor. Primary impacts would be limited to construction activities and would include temporary disturbance resulting from grading and trenching operations. After completion of construction activities, topography and associated drainages in areas of temporary disturbance would be returned to pre-construction contours and elevations to the extent practicable.

The Project pipeline crosses parcels owned by the East Alamance Quarry, a crushed stone aggregates operation, for about 230 feet near MP 66.8. Mountain Valley has adjusted the pipeline route on these parcels to reduce impacts on planned or future mining activities. At its nearest point, the proposed alignment would be 430 feet from disturbed quarry areas and Mountain Valley has committed to working with the East Alamance Quarry regarding landowner easement agreements to further minimize impacts. Therefore, we conclude that the Project would not significantly impact or be impacted by the East Alamance Quarry.

We received comments regarding the presence of uranium deposits in the Project vicinity in Pittsylvania County. The nearest commercially viable uranium deposit is 3.5 miles north of the Lambert Compressor Station, and concentrations of uranium in sediment, soils, shallow bedrock, and groundwater near the Project workspace are comparable to concentrations in the conterminous U.S. Further, uranium is generally not highly mobile in the environment, and Mountain Valley would implement its E&SC Plan to address fugitive dust mitigation, stormwater control, and erosion and sediment control measures.

The removal of bedrock, by blasting or other means, may be required if bedrock is encountered within the pipeline trench or at aboveground facility sites. Blasting events would be designed to break up only the amount of bedrock needed for construction, and impacts on bedrock would be minor and limited to the immediate area of construction. Mountain Valley would comply with all federal, state, and local blasting regulations and has developed a *General Blasting Plan* that describes measures that would be implemented to minimize potential blasting-related impacts. We have reviewed Mountain Valley's *General Blasting Plan* and find it acceptable.

The Project would cross about 1.8 miles of slopes over 30 percent. Mountain Valley completed additional field assessment and assigned site-specific control measures to these areas in their *Landslide Mitigation Report*. Although not currently identified, construction could cross karst sensitive areas. Mountain Valley would implement the measures outlined in its *Karst Hazard Assessment* to reduce the potential for subsidence if karst terrain is encountered.

Mountain Valley has proposed the use of the HDD method to cross sensitive resources at two separate locations (Dan River and Stony Creek). Mountain Valley's *HDD Contingency Plan* would ensure that drill operations are monitored and adjusted to avoid potential IRs, and if one should occur, that the release would be contained and remediated. We have reviewed Mountain Valley's *HDD Contingency Plan* and find it acceptable. Mountain Valley's geotechnical boring and hydrofracture analysis is still pending for the Dan River and Stony Creek HDD crossings, therefore we are recommending that prior to the end of the draft EIS comment period, Mountain Valley should file all outstanding geotechnical studies for the proposed Dan River and Stony Creek Reservoir HDD crossings, revised feasibility and hydrofracture analyses, and any mitigation proposed following completion of these studies.

With the implementation of the measures outlined in Mountain Valley's *Landslide Mitigation Report*, *General Blasting Plan*, *HDD Contingency Plan*, E&SC Plan, and *Karst Hazard Assessment*, we conclude that impacts on geological resources would be adequately minimized.

5.1.2 Soils

Construction of the Project facilities would temporarily and permanently disturb soils, resulting in increased potential for erosion, compaction, and reduced revegetation following construction. Mountain Valley indicates that the potential for soil erosion would be minimized through the use of erosion controls and revegetation measures described in the FERC Plan.

Permanent impacts on prime farmland and farmland of statewide importance would be limited to soils within the footprint of new aboveground facilities (about 13.9 acres total) and new permanent access roads (6.1 acres total), where soils would be permanently converted to industrial use. Agricultural activities would not be precluded within the permanent pipeline right-of-way; therefore, impacts on prime farmland and farmland of statewide importance within temporary work areas would be limited to the construction phase. Within these areas, impacts on prime farmland would be minimized by implementing BMPs based on the FERC Plan.

A total of 30 sites of potential contamination concern within 0.25 mile of the Project area were identified. Mountain Valley has prepared an *Unanticipated Discovery of Contamination Plan*, which would be used in the event that unknown areas of contaminated soils are encountered during construction of the Project. The Project is not anticipated to be affected by any identified sites based on distance from the construction work area, regulatory status (i.e., all closed, no violations found), and/or media impacted (i.e., soil only).

We conclude that Mountain Valley's implementation of the FERC Plan, Mountain Valley's Procedures, E&SC Plan, SPCC Plan, and *Unanticipated Discovery of Contamination Plan*, during construction and restoration, in combination with our recommendations, would adequately minimize impacts on soils, and no significant impacts on soils as a result of the Project would occur.

5.1.3 Water Resources

Groundwater

The Project would not cross any sole source aquifers or principal source aquifer areas. No wellhead protection areas were identified within the Project area. Landowner surveys by Mountain Valley to identify any private wells and springs that are used for potable water are not complete. Therefore, we are recommending that, prior to construction, Mountain Valley file the locations of all private water wells and springs identified within 150 feet of the Project work areas, including the well's or springs' status, use, direction, and distance from construction workspace, and any proposed mitigating actions to minimize or avoid impacts on the private water wells or springs. As described in the Project's *Water Resources Identification and Testing Plan*, Mountain Valley would offer pre-construction and post-construction water quality testing for water supply wells located within 150 feet of Project workspaces.

Although no sites of potential concern for groundwater contamination were identified within 200 feet of the Project work areas, existing contaminated groundwater resources may be encountered during construction of the Project. If contaminated groundwater is encountered during construction, Mountain Valley would implement the measures outlined in its *Unanticipated Discovery of Contamination Plan*. The Project's SPCC Plan addresses the prevention and mitigation measures that would be implemented to avoid or minimize the potential impacts of a spill during construction.

Surface Water

In general, the watersheds crossed by the Project contain development consistent with a rural environment. We expect that the water quality and biota within the Project area streams is largely reflective of the degree of upstream development. No public water supply intakes are located within 3 miles downstream of the Project.

The Project would require 224 crossings of waterbodies, 3 of which are major waterbodies. The Project crossings would follow Mountain Valley's Procedures and E&SC Plan. Mountain Valley would use HDD crossings at the Dan River and the Stony Creek Reservoir. Conventional bore crossings are proposed at Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek due to the potential presence of federal or state listed aquatic species in these systems. All other crossing would be completed using dry-ditch open-cut methods (dam-and-pump or flume method) to minimize in-stream construction and surface water impacts.

Due to site access constraints at the Deep Creek crossing, Mountain Valley has not completed the feasibility studies required to finalize its crossing plan. If the results of these studies conclude that conventional bore crossing methods are not feasible at this location, an alternative crossing method (e.g. HDD) would be used. Because studies are outstanding and to ensure our final EIS contains the most up to date information, we are recommending that Mountain Valley file a final crossing plan for Deep Creek, prior to construction. The plan should outline the crossing method and any proposed mitigation measures to minimize waterbody impacts at the crossing.

Mountain Valley would cross impaired waters using a dry-ditch crossing technique (e.g. flume or dam-and-pump) if there is flowing water at the time of construction. Mountain Valley would use BMPs and measures outlined in our Plan and Mountain Valley's Procedures, as well as the project-specific E&SC Plan to maintain stream conditions and minimize further impairment. We do not anticipate that a pipeline installed underneath waterbodies would contribute to the impairment of streams for *E. coli* and therefore would not contribute to the further impairment of Little Cherrystone Creek, White Oak Creek, and Sandy Creek in Virginia. VADEQ commented that hydroseeding could be a contributing factor to PCB concentrations in the Dan River (VADEQ 2018e). The Project would avoid hydroseeding within 100 feet of direct tributaries to the Dan River.

The segment of the Dan River crossed by the Project is included in the NRI list, but not designated as a National Wild and Scenic River. The NPS consultation indicated that an HDD crossing of the Dan River and implementation of appropriate BMPs would reduce potential impacts on the river and the surrounding landscape. Mountain Valley would install applicable BMPs outlined in the E&SC Plan and would implement the *HDD Contingency Plan.*

The Sandy River is an intermediate waterbody crossed by the Project and qualifies for a potential designation in the Virginia Scenic River Program that may result in a scenic river designation in the future. The segment of the Banister River crossed by the Project at MP 4.9 is listed as a future Blueway (a designated recreational water trail). The Sandy and Banister Rivers would be crossed using a dry crossing open-cut method (e.g. dam-and-pump or flume). While there would be minor impacts on the rivers during construction, these impacts would be short-term with the implementation of Mountain Valley's Procedures for the stream crossing. Boaters would be temporarily restricted from traversing sections of a rivers during construction. Mountain Valley would notify users of any closings through websites, at upstream access areas, and/or using other methods based on recommendations from the VADCR. The river crossing would take 3 to 7 days to complete. It is not anticipated that the river crossing would impact a significant number of boaters.

All waterbodies crossed by the Project are designated warmwater fisheries. The FERC requires all in-stream work, except the installation and removal of equipment bridges, be completed in warmwater fisheries between June 1 and November 30 unless expressly permitted or further restricted by an appropriate federal or state agency in writing. .

Mountain Valley would use a total of 5.9 million gallons of water from two municipal water sources for hydrostatic test water, HDD process water, and dust suppression. Mountain Valley states that, if needed, additional potential sources of water for dust control may include groundwater supply wells and/or approved surface waters. We are recommending that, prior to construction, Mountain Valley file its final list of water sources to be used for the Project (dust control, hydrostatic testing, and HDD operations), for our review and approval. Mountain Valley would screen the intake hose to present entrainment of aquatic species and maintain intake rates appropriate to local conditions if surface waters are used.

Temporary and localized impacts on surface waters could result from in-stream construction activities and potential erosion and runoff from upland construction. Mountain Valley would implement our Plan, Mountain Valley's Procedures, and E&SC Plan to protect surface water resources, including restoring stream habitat and restoring riparian strips along streams. We conclude that the surface water mitigation measures proposed by Mountain Valley would adequately avoid or minimize potential impacts on surface water resources. Therefore, we do not anticipate long-term or significant impacts on surface water resources because of construction or operation of the Project.

5.1.4 Wetlands

Mountain Valley made numerous modifications to its proposed route to avoid and reduce wetland crossings and impacts; however, construction of the Project would impact 26.8 acres of wetlands. Most of these impacts would be temporary and short-term. The Project's 50-foot-wide operational right-of-way would affect about 5.9 acres of wetlands, including the conversion of 0.1 acre of PSS wetland to PEM wetland, and 4.4 acres of PFO wetlands to PSS and PEM wetlands. Permanent impacts on wetlands would include the conversion of forested wetlands to scrub-shrub or emergent wetlands within the pipeline permanent easement. The majority of wetland impacts would be from temporary construction work areas (21 acres) which would be allowed to revegetate following construction.

Construction and operation-related impacts on wetlands would be mitigated by Mountain Valley's proposed construction methods and restoration measures outlined in Mountain Valley' Procedures; and compliance with the COE section 404 and state permit requirements. Mountain Valley 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. Mountain Valley identified site-specific conditions that do not allow for a 50-foot setback of ATWS from wetlands and requested approval to implement alternative measures. Based on our review, we conclude that those requests are justified. Based on the Mountain Valley's efforts to route the pipeline facilities and site aboveground facilities to avoid and minimize impacts on wetlands, and by the Mountain Valley's implementation of proposed construction and restoration plans, we conclude that impacts on wetland resources would be effectively minimized and mitigated. In addition, the COE could require Mountain Valley to offset unavoidable impacts on wetlands through implementation of an agency-approved *Compensatory Mitigation Plan*.

5.1.5 Vegetation

The Project is located wholly within the Piedmont Region and areas that have been heavily used as cropland; however, many of these areas have regrown into successional forests. Managed or developed land classes include agricultural land, commercial, industrial, and residential areas. These land classes represent about 21 percent of the proposed land that would be required for the Project. Of the about 94 percent of vegetated areas within the Project footprint, the majority (about 49 percent) consists of forested upland, followed by herbaceous/scrub-shrub upland (about 35 percent); less than 2 percent of the pipeline Project area is within wetland vegetation communities.

The primary effect of pipeline construction would be cutting, clearing, and/or removal of existing vegetation. Secondary impacts associated with disturbances to vegetation could include increased soil compaction and erosion, increased soil temperature and dryness, increased potential for the introduction and establishment of non-native and invasive species, and physical damage to nearby trees. Mountain Valley documented noxious weeds on accessible tracts during field surveys conducted in 2018. To control the spread of noxious weed species within the Project area, Mountain Valley developed an *Exotic and Invasive Plant Species Control Plan* in coordination with state agencies. Once construction is complete, Mountain Valley would monitor and control occurrences of noxious and invasive weed species throughout restoration and for 2 years following restoration in locations along the route where infestations were not identified prior to construction.

The majority of vegetation affected by construction of the Project would be upland forested land, which would result in long-term impacts. To minimize forest fragmentation and edge effects, Mountain Valley has collocated about 54 percent (40 miles) of the pipeline route with existing linear corridors. The permanent footprint at the Lambert Compressor Station, and other aboveground facilities would be converted to developed land. Areas used for temporary and additional workspace at each facility would be restored and maintained as open land or allowed to revert to pre-construction land use cover.

Mountain Valley states that merchantable timber would be cut to useable lengths and stacked on the edge of the right-of-way to a maximum height of 4 feet with openings every 200 feet to allow the safe passage of wildlife. Mountain Valley further states that brush cleared from the construction corridor would be open burned, windrowed, chipped/mulched, or hauled off for disposal at an approved location. According to Mountain Valley, chipped brush would be blown off of the right-of-way with landowner approval. Chips would not be blown into environmentally sensitive areas (i.e., waterbodies, wetlands, and habitat for special status species). Mountain Valley's proposed timber and brush disposal methods, specifically windrowing of timber along the right-of-way and blowing chipped brush off the right-of-way without being hauled off and used for beneficial reuse by the landowner, are not consistent with the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan*, section III.E. Therefore we are recommending that prior to construction, Mountain Valley should file revised plans to dispose of brush and timber, for our review and approval.

Following construction, Mountain Valley would seed the construction workspace and allow natural succession to revegetate workspaces disturbed by construction in accordance with the FERC Plan and Mountain Valley's Procedures. Mountain Valley would use and apply a seed mix that incorporates recommendations from the local soil conservation authority, the landowner, or land management agency. Mountain Valley would mow or clear vegetation within the operational right-of-way every 3 years. However, Mountain Valley proposes to maintain an herbaceous corridor up to 10 feet wide centered on the pipeline to facilitate periodic corrosion/leak surveys.

Impacts on forested and non-forested vegetation types, as well as the potential introduction or spread of noxious weeds or invasive plant species, would be minimized through adherence to the measures outlined in the FERC Plan and Mountain Valley's Procedures, and other mitigation measures. Therefore, given the amount of collocation with existing, maintained rights-of-way and the presence of similar vegetation communities in Virginia and North Carolina, we conclude that impacts on vegetation, including forested areas, would not be significant.

5.1.6 Wildlife and Aquatic Resources

Constructing the Project would disturb about 1,300 acres of wildlife habitat, including agricultural lands. The temporary and permanent loss and/or conversion of habitat and the general disturbance created by the use of construction equipment would impact wildlife. This impact would vary depending on the type and quantity of habitat affected and the ability of species to leave Project work areas and successfully use adjacent habitats. Constructing the Project may result in limited mortality of less mobile animals, such as small rodents, reptiles, amphibians, and invertebrates, which may not be able to relocate from the immediate construction area.

To increase the speed and success of restoration of wildlife habitat, Mountain Valley would implement right-of-way restoration measures contained in the FERC Plan and Mountain Valley's Procedures and solicit guidance from the NRCS, VADCR, and NCWRC to restore the pipeline corridor using native seed mixes specific to the Project locations. Additionally, Mountain Valley would allow the right-of-way adjacent to a 10-foot-wide strip over the pipeline to grow as scrub-shrub habitat, which would provide a more gradual transition between the pipeline corridor and surrounding forested habitat.

The Project would not cross any National Wildlife Refuges, Wildlife Management Areas, or other federally protected lands. Nor would the Project come within 3 miles of any state Wildlife Management or Game Areas in Virginia or North Carolina, respectively. However, the Project would cross multiple state-managed or private conservation areas, including two North Carolina Forest Legacy Areas (MPs 26.1 to 36.3 and MPs 42.2 to 48.4) and a Piedmont Land Conservancy Easement. The Project would also pass through about 3 miles of the Virginia Piedmont Forest Block Complex IBA between MPs 22.7 and 25.7.

Mountain Valley would attempt to minimize Project impacts on migratory birds by conducting vegetation clearing during construction outside of the peak migratory bird nesting season (May 1 through August 15). The USFWS recommended that Mountain Valley avoid clearing from March 15 - August 15 in Virginia and from April 1 - August 31 in North Carolina. It is possible that Mountain Valley would need to clear during the nesting season based on its current projected schedule; therefore, we are recommending that prior to construction, Mountain Valley should consult with the U.S. Fish and Wildlife Service regarding appropriate protocols to minimize impacts on migratory birds during the nesting season and file these consultations and mitigation measures for our review and approval.

Mountain Valley has also minimized the impact on migratory bird habitat by collocating the Project route with existing rights-of-way or previously disturbed habitat. Given the steps Mountain Valley would take to attempt to minimize Project impacts on migratory birds, and the relatively low percentage of forested habitat generally and interior forest habitat specifically that would be affected in comparison with available forested habitat in the vicinity of the Project, we conclude Project impacts on migratory birds would be avoided or minimized to the extent practicable.

To account for the possibility of bald eagles building a nest in the vicinity of the Project, Mountain Valley would conduct bald eagle nest surveys during the winter prior to the beginning of construction within 0.5 mile of the Project. Mountain Valley also received a recommendation from the NCWRC in August of 2018 (NCWRC, 2018b) to avoid construction activities within 0.5 mile of any active colonial nesting bird rookeries. The NCWRC further recommended that Mountain Valley conduct surveys for rookeries within 0.5 mile of the Project rights-of-way during the winter months prior to construction. Mountain Valley has accordingly committed to conducting the rookery surveys concurrently with the bald eagle nest surveys. Additionally, Mountain Valley would maintain established landscape buffers between Project-related activities and active rookeries and would refrain from construction activities within 0.5 mile of any rookery between February 15 and July 31. Based on Mountain Valley's intent to conduct rookery and bald eagle surveys, and implement the noted protective measures, we conclude Project impacts on colonial nesting birds and bald eagles would be avoided or minimized to the extent practicable; however, to confirm whether Mountain Valley would need to implement the above-noted measures protective of nesting bald eagles and/or colonial rookeries, we are recommending that Mountain Valley should file the results of the pre-construction bald eagle nest and colonial rookery surveys.

The Project would cross 21 perennial waterbodies containing fisheries of special concern; 8 in Virginia, and 13 in North Carolina. Constructing and operating the Project could temporarily impact fisheries and aquatic resources. Sedimentation and turbidity, alteration or removal of in-stream and stream bank cover, stream bank erosion, introduction of water pollutants, water depletions, and entrainment of small fishes and fry during water withdrawals could increase the rates of stress, injury, and mortality experienced by fish and other aquatic life. In general, fish would migrate away from these activities.

Mountain Valley would implement erosion and sediment control BMPs described in its E&SC Plan at all crossings of waterbodies. The majority of waterbody crossings for the Project would be dry open-cut crossings (flume, dam-and-pump, or cofferdam). The Dan River and Stony Creek Reservoir are proposed to be crossed via an HDD; and three locations are proposed to be crossed via conventional bore including Cascade Creek/Dry Creek, Wolf Island Creek, and Deep Creek. Mountain Valley also would adhere to all federal and state permit conditions, including those regarding the minimization of impacts on fisheries of special concern (adhering to recommended work windows for in-water construction or requesting a work-window modification, if needed).

Based on our review of the potential impacts and mitigation measures, we conclude that constructing and operating the Project would not significantly impact wildlife, terrestrial habitats, migratory birds, or fisheries and aquatic resources.

5.1.7 Special Status Species

Federal agencies are required by the 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 determining whether any federally 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. There are five federally listed threatened or endangered species, two species of concern, and one species that is proposed as threatened that could potentially be affected by the Project. We have determined that the Project would not likely adversely affect these species, and we are asking the FWS to consider this draft EIS as our Biological Assessment for the Project. Our determinations of effect are based on current information available for the species in the Project area. To date, Mountain Valley has not completed surveys or provided survey results to the Commission for federally listed bat hibernacula, aquatic biota, and plant species along the Project survey corridor. Because compliance with Section 7 of the ESA is not complete, we recommend that Mountain Valley not begin construction until we complete informal or formal consultation with the FWS, if required, and Mountain Valley has received written notification from the Director of the OEP that construction or use of mitigation may begin.

5.1.8 Land Use, Recreation, and Visual Resources

The primary land uses affected by construction would be forested/woodland and open land. Agricultural, silviculture, industrial/commercial, and residential would make up the remaining 21.2 percent of land types affected during construction. Operating the Project would permanently impact about 451.8 acres. The permanent operational easement would account for 424.2 acres. The remaining 27.6 acres of permanent impact would be associated with aboveground facilities, cathodic protection beds, and permanent access roads.

Mountain Valley considered existing developed residential areas and planned residential developments, including short segments of the route at road crossings with homes near the route alignment, as residential land use. As currently designed, 19.2 acres of residential land would be affected by construction of the pipeline (9.9 acres) and access roads (9.3 acres). Mountain Valley prepared and would adhere to site-specific *Residential Construction Plans* for 36 residential structures currently identified within 25 feet of construction work areas or where a plan was requested by FERC. Mountain Valley would work with landowners to either protect, purchase or relocate structures within the proposed construction right-of-way. We encourage the owners of each of these residences to provide us comments on the plan specific for their property during the draft EIS comment period. Four of the residences would be within 10 feet of the edge of construction workspace, or new temporary access roads, due to the construction constraints along those portions of the Project route. We are recommending that, prior to the end of the draft EIS comment period, Mountain Valley provide evidence of landowner concurrence with the site-specific *Residential Construction Plans* for four residences where construction work areas, or new temporary access roads, would be within 10 feet of a residence at MPs 67.3, 67.8, 67.9, and 72.9.

Mountain Valley contacted local planning agencies and identified one planned residential and commercial development within 0.25 mile of the Project. The Granite Mill Project includes the redevelopment of an abandoned mill to include new apartments and commercial space. Mountain Valley proposed to use access road TA-AL-187, an existing road through the redevelopment site. The residential portion of the redevelopment project is expected to be complete in December 2019 and full completion of the commercial redevelopment is anticipated for end of 2022. Mountain Valley stated it would work with the developer to identify any mitigation measures that may be needed during construction of the Southgate Project. Because use of this access road could negatively affect the new residences through heavy construction traffic and to ensure our final EIS contains the most up to date information, we are recommending Mountain Valley provide, prior to end of the draft EIS comment period, a feasibility assessment for constructing the Project without the use of access road TA-AL-187.

5.1.9 Socioeconomics

The Project may affect the socioeconomic character of communities near the proposed facilities. These potential impacts include temporary population increases, new employment opportunities, increased demand for housing and public services, impacts on tourism and local businesses, transportation impacts, environmental justice, and revenues associated with sales and payroll taxes.

The Project construction workers would be spread out along two separate pipeline spreads within three counties over a short construction timeframe. Non-local construction workers could easily be absorbed within the populations of the affected counties. The Project would not have a significant effect on any one counties' population, nor would it have significant adverse impacts on housing. Also, any increase in local employment rates from construction of the Project in these counties or the surrounding areas would be temporary and minor, and the Project is unlikely to noticeably affect local unemployment rates.

Each county within the Project area has numerous fire and police departments. Mountain Valley would work with local fire departments, police departments, and emergency first responders to discuss any Project needs, including traffic assistance and emergency response preparedness. The communities in the Project area have adequate public service infrastructure to meet the potential needs of non-local workers who relocate temporarily. Therefore, we conclude that the Project would not significantly impact public services.

Mountain Valley would inspect roads periodically and, if damages occur as a direct result of Project-related activities, would repair them as appropriate and in accordance with the applicable permit. Following construction, roads would be restored to their original conditions unless otherwise directed by the landowner, county, or state agency. Construction activities would result in temporary to short-term impacts on transportation infrastructure.

The Project would not have a significant adverse impact on property values. Additionally, we conclude that homeowners' insurance rates are unlikely to change, and the Project would not affect the ability of homeowners to obtain fair market base priced insurance.

The Project would result in some beneficial impacts on the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables Project-specific materials, room rentals, and sales tax. Operation of the Project would result in long-term ad valorem property tax benefits for the counties crossed by the Project.

Although low-income and minority populations exist within the Project area, the Project would not have a disproportionately high and adverse environmental or human health impact on minority or low-income populations.

5.1.10 Cultural Resources

Mountain Valley conducted cultural resources surveys through June 2019 and identified a total of 65 archaeological sites and 161 historic architectural sites within the direct APE. Of the archaeological sites, 39 were evaluated as not eligible for the NRHP, 19 were assessed as potentially eligible or unevaluated, 3 require additional investigations before a determination of eligibility can be made, and 4 are of unknown eligibility. . Of the historic architectural sites, 118 were evaluated as not eligible, 7 are potentially eligible or unevaluated, 31 are unknown or have incomplete assessments, 2 should be treated as eligible, 1 is eligible, and 2 are listed in the NRHP. No further work was recommended for the sites not eligible for the NRHP. Avoidance or additional evaluation investigations were recommended for the potentially eligible or unevaluated sites. Because compliance with Section 106 of the NHPA is not complete, we recommend that Mountain Valley not begin construction until all outstanding archaeological and architectural surveys are complete; survey and evaluation reports and treatment or avoidance plans, if required, have been prepared and reviewed by the SHPOs; the ACHP is provided an opportunity to comment if historic properties would be adversely affected; and we provide written notice to proceed.

5.1.11 Air Quality and Noise

Air quality impacts associated with construction of the Project would include emissions from construction equipment and fugitive dust. Such air quality impacts would generally be temporary and localized and are not expected to cause or contribute to a violation of applicable air quality standards. Mountain Valley would implement mitigation measures to minimize the generation of dust and reduce construction impacts on air quality. Once construction activities in an area are completed, fugitive dust and construction equipment emissions would subside, and the impact on air quality due to construction would cease. As a result, we conclude that the Project's construction-related impacts would not result in a significant impact on local or regional air quality.

Operational emissions would be generated by the Lambert Compressor Station, as well as minimal emissions from maintenance blowdowns and incidental leaks from the pipeline and four interconnects. Mountain Valley submitted a minor NSR permit application for operation of the compressor station in accordance with Virginia regulations, including an assessment of Best BACT for $PM_{2.5}$ emissions. Minimization of operational air pollutant emissions would be achieved by using advanced low NOx turbine combustors, clean-burning fuels, and self-cleaning turbine inlet air filters. Air quality dispersion modeling for the compressor station confirmed that operational emissions would not exceed the air quality standards or the formaldehyde significant ambient air concentration. As a result, we conclude that the Project's operational emissions would not result in a significant impact on local or regional air quality.

Residence near the construction areas may experience an increase in perceptible noise, but the effect would be temporary and localized. Noise mitigation would be implemented during construction as necessary including the use of residential-grade exhaust mufflers on engines and barriers between construction activity and NSAs, as well as, limiting some construction to daytime hours. Based on proposed 24-hour construction activities at the LN 3600, T-15 Dan River, and/or T-21 Haw River Interconnects, we have recommended that, prior to nighttime construction, Mountain Valley file a Nighttime Construction Noise Management Plan, for our review and approval. As a result, we conclude that construction of the Project would not result in significant noise impacts on residents and the surrounding communities.

Operational noise impacts would be limited to areas near the aboveground facilities, primarily the Lambert Compressor Station. Noise impacts on NSAs due to operation of the pipeline, meter stations, and compressor station would be negligible to barely perceptible. However, we have included a recommendation for Mountain Valley to verify the actual noise levels from operation of the compressor station at full load. Noise from planned or unplanned blowdown events would be loud, but infrequent and of short duration. For construction of the Project's proposed aboveground facilities, nighttime work would be conducted for specific situations related to safety, permit compliance, or other non-typical circumstances. Noise levels due to 24-hour construction of the Lambert Compressor Station would be below the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. However, noise levels due to 24-hour construction of the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects would all be above the FERC criterion of 55 dBA L_{dn} at the nearest NSAs. Mountain Valley would develop a *Nighttime Construction Noise Management Plan* before nighttime construction is required at the compressor station or meter stations. This plan would list the noise levels from the selected nighttime equipment at the nearest NSAs. If resulting noise is above 55 dBA L_{dn}, the plan would identify specific noise mitigation, such as noise barriers, quieter equipment, or partial equipment enclosures that would reduce noise levels to under 55 dBA L_{dn}. We are recommending that Mountain Valley file this plan prior to nighttime construction. Based on the analyses conducted, mitigation measures proposed, and our recommendations, we conclude that operation of the Project would not result in significant noise impacts on residents and the surrounding communities.

5.1.12 Safety

The Project would be designed, constructed, operated, and maintained to meet the DOT *Minimum Federal Safety Standards* in 49 CFR 192 and other applicable federal 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 natural gas safely.

The proposed facilities would be regularly inspected for leakage and potential pipeline hazards such as construction activity, encroachments, and evidence of recent unmonitored excavations 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 and maintaining MLVs and meter stations; and conducting leak surveys at least once every calendar year or as required by regulations.

Mountain Valley has prepared an *Emergency Plan* that provides procedures to be followed in the event of an emergency that would meet the requirements of 49 CFR 192.615. The plan includes procedures to protect the safety of the public and employees; to prevent or minimize facility and property damage; to maintain continuity of service or re-establish service should an interruption occur; and to assure immediate reporting and investigation of emergencies.

Mountain Valley would follow federal safety standards for pipeline class locations based on population density. The DOT regulations are designed to ensure adequate safety measures are implemented to protect all populations. We conclude that Mountain Valley's compliance with applicable design, construction and maintenance standards, and DOT safety regulations would be protective of public safety.

5.1.13 Cumulative Impacts

We analyzed cumulative impacts of the Southgate Project, in addition to other projects that may impact resources within the same geographic scope and timeframe. The other projects we examined include FERC-jurisdictional natural gas transportation projects; non-jurisdictional project-related facilities; other energy projects; mining operations; transportation or road projects; and commercial/residential/industrial and other development projects.

Most of the impacts resulting from construction and operation of the Southgate Project would be temporary and localized, contained within the right-of-way and extra workspaces, and when added to the impacts of other projects are not expected to result in significant cumulative impacts. However, some long-term cumulative impacts would occur in forested wetlands and forested uplands. Given the Southgate Project BMPs, design features, and mitigation measures that would be implemented; and the federal and state laws and regulations protecting resources, and permitting requirements for the other projects evaluated, we conclude that when added to other past, present, and reasonably foreseeable future actions, cumulative impacts on environmental resources within the geographic scopes affected by the Southgate Project would not be significant.

5.1.14 Alternatives

As required by NEPA and Commission policy, we identified and evaluated reasonable alternatives to the Project to determine whether the implementation of an alternative would be environmentally preferable to the proposed action. The no-action alternative was considered for the Project. While the no-action alternative would eliminate the environmental impacts identified in the EIS, the stated objectives of the Applicant's proposal would not be met. Further, the natural gas shippers could seek alternative transportation infrastructure that would impact similar resources as the Project.

Our analysis of system alternatives included an evaluation of whether existing or proposed natural gas pipeline systems could meet the Project's objectives. We could not identify any existing and approved interstate natural gas transmission systems that have available individual capacity, combined available capacity, nor direct physical connection to transport the required volumes of natural gas to the delivery points proposed for the Project. Furthermore, modifications of existing and approved systems would result in environmental impacts similar to those that would occur as proposed by the Project.

During the pre-filing and environmental scoping process, Mountain Valley incorporated over 100 route variations into the Southgate route to avoid and/or minimize impacts on specific resources at the request of landowners and stakeholders. We evaluated three major route alternatives, including the Berry Hill Alternative, Lake Cammack East Alternative, and the North-South Alternative. We also evaluated five minor route alternatives and 11 minor route variations. However, when considering all affected resources, theses route alternatives/variations do not offer a significant environmental advantage when compared to the proposed route.

We evaluated the feasibility of using electric motor-driven compressors at the proposed Lambert Compressor Station as an alternative to the proposed natural gas-fired reciprocating engines and natural gas-fired turbines. However, the use of electric-driven compressors 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 regional emissions from the electric power generating stations.

Based on our findings, we conclude that the proposed Project is the preferred alternative that can meet the Project purpose.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Project, we recommend that the following measures be included as specific conditions in the Commission's Order. We have determined that these measures would further mitigate the environmental impacts associated with Project construction and operation as proposed.

We have included some recommendations that require Mountain Valley to provide updated information and/or documents prior to the end of the draft EIS comment period. We do not expect that this information will materially change any of the conclusions presented in this draft EIS. The section number in parentheses at the end of a condition corresponds to the section number in which the measure and related resource impact analysis appears in the EIS.

1. Mountain Valley shall follow the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), and as identified in the EIS, unless modified by the Order. Mountain Valley 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, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of environmental resources during construction and operation of the Project. This authority shall allow:

a. the modification of conditions of the Order;

b. stop-work authority; and

c. the imposition of any additional measures deemed necessary to ensure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from Project construction and operation.

3. **Prior to any construction,** Mountain Valley shall file affirmative statements with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EIs' authority and have been or will 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. **As soon as they are available, and before the start of construction**, Mountain Valley 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.

   Mountain Valley'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. Mountain Valley's right of eminent domain granted under NGA Section 7(h) does not authorize it to increase the size of its 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. Mountain Valley shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all facility relocations, and staging areas, construction support areas, 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. All areas 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 Commission's *Upland Erosion Control, Revegetation, & Maintenance 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 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. **Within 60 days of the acceptance of the Certificate and before construction begins**, Mountain Valley shall file its Implementation Plan with the Secretary, for review and written approval by the Director of OEP. Mountain Valley must file revisions to its plans as schedules change. The plans shall identify:

a. how Mountain Valley will 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 Mountain Valley will 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/or facility, and how Mountain Valley will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;

e. the location and dates of the environmental compliance training and instructions Mountain Valley will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses 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 Mountain Valley's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Mountain Valley will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar Project scheduling diagram), and dates for:

the completion of all required surveys and reports;

the environmental compliance training of on-site personnel;

the start of construction; and

the start and completion of restoration.

7. Mountain Valley 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 EIs shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or 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 its Implementation Plan, Mountain Valley shall file updated status reports with the Secretary on a **weekly** basis until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include the following:

a. an update on Mountain Valley'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;

e. the effectiveness of all corrective and remedial actions implemented;

f. a description of any landowner/resident complaints which 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 Mountain Valley from other federal, state, or local permitting agencies concerning instances of noncompliance, and Mountain Valley's response.

9. Mountain Valley shall develop and implement an environmental complaint resolution procedure, and file such procedure with the Secretary, for review and approval by the Director of OEP. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project and restoration of the right-of-way. **Prior to construction**, Mountain Valley shall mail the complaint procedures to each landowner whose property will be crossed by the Project.

   a. In its letter to affected landowners, Mountain Valley shall:

      i. provide a local contact that the landowners should call first with their concerns; the letter shall 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 Mountain Valley's Hotline; the letter shall indicate how soon to expect a response; and

      iii. instruct the landowners that if they are still not satisfied with the response from Mountain Valley's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

   b. In addition, Mountain Valley shall include in its **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, will be resolved, or why it has not been resolved.

10. Mountain Valley must receive written authorization from the Director of OEP **before commencing construction of any Project facilities**. To obtain such authorization,

Mountain Valley must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Mountain Valley must receive written authorization from the Director of OEP **before placing the Project facilities into service**. Such authorization would only be granted following a determination that rehabilitation and restoration of the areas affected by the Project are proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in-service**, Mountain Valley shall file an affirmative statement 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 will be consistent with all applicable conditions; or

    b. identifying which of the conditions of the Order Mountain Valley has complied with or will comply with. This statement shall also identify any areas affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

13. **Prior to the end of the draft EIS comment period,** Mountain Valley shall file with the Secretary all outstanding geotechnical studies for the proposed Dan River and Stony Creek Reservoir HDD crossings, revised feasibility and hydrofracture analyses, and any proposed mitigation following completion of these studies (4.1.4.9).

14. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, the locations of all private water wells and springs identified within 150 feet of the Project work areas, including the well's or springs' status, use, distance from construction workspace, and any proposed measures to minimize or avoid impacts on the private water wells or springs (4.3.1.2).

15. **Prior to construction,** Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, a final crossing plan for Deep Creek that outlines the crossing method and any proposed mitigation measures to minimize waterbody impacts at the crossing (4.3.2.2).

16. **Prior to construction**, Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, its final list of water sources to be used for the Project (dust control, hydrostatic testing, and HDD operations), including intake location, waterbody name, withdrawal rate and method, and measures to minimize entrainment of fish (4.3.2.7).

17. **Prior to construction,** Mountain Valley shall file with the Secretary, for review and written approval by the Director of OEP, revised plans to dispose of brush and timber that are in accordance with the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan,* section III.E (4.5.4.1).

18. **Prior to construction,** Mountain Valley shall consult with the FWS and identify measures to minimize impacts on migratory birds if vegetation clearing for construction will occur during the migratory bird nesting season (March 15 - August 15 in Virginia and April 1 - August 31 in North Carolina). Mountain Valley shall file these measures with the Secretary, for review and written approval by the Director of OEP, along with records of its consultation with FWS (4.6.3.2).

19. **Prior to construction,** Mountain Valley shall file with the Secretary, the results of the pre-construction bald eagle nest and colonial rookery surveys (4.6.3.6).

20. Mountain Valley shall **not begin** construction activities **until**:

    a. the staff receives comments from the FWS regarding the proposed action;

    b. the staff completes ESA consultation with the FWS; and

    c. Mountain Valley has received written notification from the Director of OEP that construction or use of mitigation may begin (4.7.5).

21. **Prior to the end of the draft EIS comment period,** Mountain Valley shall file with the Secretary evidence of landowner concurrence with the site-specific residential construction plans for residences at MPs: 67.3, 69.6, 69.7, 72.9, where the pipeline construction right-of-way or a new access road would be within 10 feet of the residence, or file a plan to modify the workspace in these locations to provide at least 10 feet between the residences and the workspace (4.8.3.1).

22. **Prior to the end of the draft EIS comment period,** Mountain Valley shall file with the Secretary a feasibility assessment for constructing the Project without the use of access road TA-AL-187 (4.8.3.2).

23. Mountain Valley shall **not begin** construction of facilities and/or use of all staging, storage, or temporary work areas and new or to-be-improved access roads **until**:

    a. Mountain Valley files with the Secretary:

        i. remaining cultural resources survey reports;

        ii. site evaluation reports and avoidance or treatment plans, as required; and

        iii. comments on the cultural resources reports and plans from the Virginia and North Carolina SHPOs and interested Indian tribes.

    b. The ACHP is afforded an opportunity to comment if historic properties would be adversely affected; and

    c. The FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies Mountain Valley in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

    All materials filed with the Commission containing 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**." (4.10.5)

24. **Prior to nighttime construction at the LN 3600, T-15 Dan River, and T-21 Haw River Interconnects**, Mountain Valley shall file its Nighttime Construction Noise Management Plan with the Secretary, for review and written approval by the Director of OEP. (4.11.2.3).

25. **No later than 60 days after placing the Lambert Compressor Station (including the Interconnect) into service**, Mountain Valley shall file a noise survey with the Secretary. If a full load condition noise survey is not possible, Mountain Valley shall provide an interim survey at the maximum possible load **within 60 days** of placing the station into service and provide the full load survey **within 6 months**. If the noise attributable to the operation of the equipment at the station under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearest NSA, Mountain Valley 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. Mountain Valley shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls (4.11.2.3).

APPENDIX A

Distribution List for the Draft Environmental Impact Statement

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APPENDIX A: DISTRIBUTION LIST FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

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State of North Carolina

Dan Forest, Lt. Governor
Roy Cooper, Governor

Wildlife Resources Commission

Brena Jones, Central Aquatic Wildlife Diversity Coordinator
Jeffery Hall, Partners in Amphibian & Reptile Conservation Biologist
John Isenhour, Technical Assitance Biologist
Olivia Munzer, Western Piedmont Habitat Conservation Coordinator
Shannon Deaton, Chief, Habitat Conservation Division
Tyler Black, Eastern Region Aquatic Wildlife Diversity Research Coordinator
Vann Stancil, Special Project Coordinator
David Cox, Habitat Conservation Program Supervisor
Gordon Myers, Executive Director

Kyle Briggs, Chief Deputy Director

State Agencies of Virginia

Chamber of Commerce

Brian Ball, Secretary of Commerce and Trade
Ryan Dunn

Commonwealth of Virginia

Justin Fairfax, Lt. Governor
Kelly Thomasson, Secretary of the Commonwealth
Ralph Northam, Governor
Todd Haymore, Secretary of Commerce

Department of Agriculture and Consumer Services

Charles Green, Acting Deputy Commissioner
Jewel H. Bronaugh, Commissioner

Department of Conservation and Recreation

Clyde Cristman, Director
Craig Seaver, Division Director
Joseph Weber, Natural Heritage Information Manager
Timothy Hatton, Office Manager, Natural Heritage Contact
Jason Bullock, Environmental Manager II
Tyler Meader, Environmental Specialist I
Beth Reed, Administrative and Office Specialist
Theresa Duffey, Natural and Cultural Resource Manager
Rene Hypes, Environmental Manager I
Robbie Rhur, Environmental Planner II

Department of Environmental Quality

Receipts Control
Benjamin Leach, Erosion & Sediment Control & Stormwater Management
Brad White, Groundwater Specialist, Piedmont Region
Dave Davis, Director
David Paylor, Director
Greg Bilyeu, Director of Communications
Hannah Zegler, Erosion & Sediment Control & Stormwater Management
Jaime Robb, Office of Stormwater Management
Jerome Brooks, Office of Water Compliance
Joel P. Maynard, GIS
Julia Wellman, Environmental Impact Review Coordinator
Jutta Schneider, Water Planning Division Director
Michael Dowd, Director
Patrick Corbett, Air Toxics Coordinator
Sandra Mueller, Water Monitoring and Assessment Program Manager
Scott Kudlas, Director
Stan Faggert, Minor New Source Review Coordinator
Tamera Thompson, Manager, Office of Air Permitting
Trieste Lockwood, Senior Policy Advisor
James Golden, Director of Operations

Office of Air Quality Assessments

Michael Kiss, Manager

Piedmont Regional Office
Anthony Cario, Wetland & Stream Protection Staff

Blue Ridge Regional Office
Paul Jenkins, Regional Air Permitting Manager
Anita Walthall, Air Permit Writer Senior

Office of Environmental Impact Review
Bettina Rayfield, Manager

Water Division
Melanie Davenport, Director

Department of Forestry
Drew Arnn, Senior Area Forester
Mike Santucci, Forestland Conservation Program Manager

Department of Game and Inland Fisheries
Brian Watson, Aquatic Resources Biologist/Malacologist
Michael Pinder, Aquatic Biologist
Ray Fernald, Environmental Services Section Manager
Robert Duncan
Sergio Harding, Nongame Bird Conservation Biologist
Amy Ewing, Environmental Services Biologist
David Whitehurst, Director
Ernie Aschenbach, Environmental Services Biologist
Rick Reynolds, T&E Bat Survey Contact

Department of Health, Office of Drinking Water
Aaron Moses, Source Water Program Manager
Mary Mahoney, Source Water Protection Program Assistant

Department of Historical Resources
Mark Holma, Project Review Architectural Historian

Department of Mines, Minerals and Energy
Rick Cooper, Director

Department of Transportation
Stephen C. Bruch, Commissioner

Department of Environmental Protection
Randy Owen, Deputy Chief, Habitat Management Division

Division of Geology and Mineral Resources
Lorrie Coiner, Geologist

Economic Development Partnership
Vince Barnett, Vice President, Business Investment

Office of the Governor

Matthew Strickler
Clark Mercer, Chief of Staff

Marine Resources Commission
Mike Johnson, Habitat Management
Randy Owen, Project Manager

State Historic Preservation Office
Julie Langan, State Historic Preservation Officer

Roger Kirchen, Director
Stephanie Williams, Deputy State Historic Preservation Officer

Native American Tribes

Absentee-Shawna Tribe of Oklahoma
Devon Frazier, Tribal Historic Preservation Officer
Edwina Butler-Wolfe, Governor
Erin Thompson, Tribal Historic Preservation Officer

Catawba Indian Nation
Caitlin Haire, Tribal Historic Preservation Office
Caitlin Totherow, Tribal Historic Preservation Officer
Darin Steen, Environmental Services Director
Evie Stewart, Tribal Administrator
Wenonah G. Haire, Tribal Historic Preservation Officer
William Harris, Chief

Cayuga Nation
Clint Halftown, National Representative

Cheroenhaka (Nottoway) Tribe
Ellis Wright, Vice Chief
Walt Brown, Chief

Cherokee Nation of Oklahoma
Bill John Baker, Principal Chief
Elizabeth Toombs, Tribal Historic Preservation Officer

Cheyenne River Sioux Tribe
Steve Vance, Tribal Historic Preservation Officer

Chickahominy Tribe
Ruth Hennamen
Stephen Adkins, Chief

Chickahominy Tribe Eastern Division
Gene Pathfollower Adkins, Chief
Gerald Stewart, Chief

Chickasaw Nation
Bill Anoatubby, Governor
Kirk Perry

Choctaw Nation of Oklahoma
Gary Batton, Chief
Ian Thompson, Tribal Historic Preservation Officer

Coharie Tribe
Freddie Carter, Chair
Gene Jacobs, Chief
Greg Jacobs, Executive Director

Delaware Nation

Darren Hill, Director of Cultural Preservation Program
Deborah Dotson, President
Kim Penrod, Director of Cultural Resources
Nekole Alligood, Director of Cultural Resources

Delaware Tribe Historic Preservation
Susan Bachor, Historic Preservation Representative

Delaware Tribe of Indians
Brice Obermeyer, Historic Preservation Director
Chester Brooks, Chief

Eastern Band of Cherokee Indians
Holly Austin, Tribal Historic Preservation Officer
Richard Sneed, Principal Chief
Russell Townsend, Tribal Historic Preservation Officer

Eastern Shawnee Tribe of Oklahoma
Brett Barnes, Tribal Historic Preservation Officer
Glenna Wallace, Chief

Haliwa-Saponi Tribe
Archie Lynch, Tribal Administrator
Michael Richardson, Chair
Ogletree Richardson, Chief

Jena Band of Choctaw Indians
Alina Shively, Tribal Historic Preservation Officer
Cheryl Smith, Principal Chief

Lumbee Tribe
Dock Locklear, Acting Administrator
Freda Porter, Administrator
Harvey Godwin, Tribal Chair

Mattaponi Tribe
Mark Custalow, Chief

Meherrin Indian Tribe
Jonathan Caudill, Jr., Chair
Wayne Brown, Chief/Tribal Administrator

Mississippi Band of Choctaw Indians
Phyliss Anderson, Chief

Monacan Nation
Dean Branham Chief

Muscogee (Creek) Nation
Corain Lowe-Zepeda, Tribal Historic Preservation Officer
James Floyd, Principal
Raelynn Butler, Manager, Historic and Cultural Preservation

Nansemond Indian Tribe

Lee Lockamy, Chief
Barry Bass, Chief
Samuel Bass, Chief

Nottoway Indian Tribe of VA

Beth Roach
Leroy Hardy, Councilman
Lynette Allston, Chief
William Wright

Occaneechi Band of the Saponi Nation

Vickie Jeffries, Tribal Administrator
W.A. "Tony" Hayes, Tribal Chair

Oneida Indian Nation

Jesse Bergevin, Historian
Raymond Halbritter, National Representative

Oneida Indian Nation of Wisconsin

Corina Williams, Tribal Historic Preservation Officer
Tehassi Hill, Chair

Onandaga Nation

Sidney Hill, Chief
Tony Gonyea, Faithkeeper

Ottawa Tribe of Oklahoma

Ethel Cook, Chief
Rhonda Hayworth, Tribal Historic Preservation Officer

Patawomeck Tribe

Charles Bullock, Assistant Chief
John R. Lightner, Chief

Pawmunkey Tribe

Robert Gray, Representative

Poarch Band of Creek Indians

Carolyn White Tribal Historic Preservation Officer
Stephanie Bryan Chair

Rappahannock Tribe

Anne RichardsonChief

Rosebud Sioux Tribe of Indians

Ben Rhodd, Tribal Historic Preservation Officer
Russell Eagle Bear, Tribal Historic Preservation Officer

Sapony Tribe

Dante Desiderio, Executive Director
Dorothy Crowe, Tribal Chair

Otis K. Martin

Seneca Nation of Indians

Morris Abrams, Tribal Historic Preservation Officer
Todd Gates, President
Jay Toth, Tribal Archeologist, Tribal Historic Preservation Office

Seneca-Cayuga Nation

William Fisher, Chief
William Tarrant, Tribal Historic Preservation Officer

Shawnee Tribe

Tonya Tipton, Historic Preservation Officer

Shawnee Tribe of Oklahoma

Kim Jumper, Preservation Office
Ron Sparkman, Chief

St. Regis Mohawk Tribe

Arnold Printup, Tribal Historic Preservation Officer
Beverly Cook, Chief

Stockbridge-Munsee Community of Wisconsin

Shannon Holsey, President
Bonney Hartley, Tribal Historic Preservation Officer

Tonawanda Band of Seneca Indians of New York

Kevin Jonathan, NAGPRA Contact
Roger Hill, Chief

Tuscarora Nation

Neil Patterson, Director of the Chiefs Council, Tuscarora Environmental Program
Bryan Printup, Representative
Leo Henry, Chief

United Keetoowah Band of Cherokee Indians in Oklahoma

Joe Bunch, Chief
Lisa Stopp, Tribal Historic Preservation Officer
Karen Prichett, TCNS Coordinator

Upper Mattaponi Tribe

Frank Adams, Chief
Kenneth Adams, Chief

Waccamaw Sioux Tribe

Brenda Moore, Housing Coordinator
Lacy Wayne Freeman, Chief
Matthew Blanks, Tribal Council Chair

State Representatives and Senators

North Carolina Senate
Michael Garrett

Virginia Senate
David Suetterlein
Steve Newman
Tommy Norment
Frank Ruff

Virginia House of Delegates
Terry Kilgore, 1st District Delegate

Virginia 9th District
Morgan Griffith, 9th Congressional District Congressman

City Agencies

Alamance County
Brian Baker, Director of Parks and Recreation
Bruce Waller, Assistant County Manager
Bryan Hagood, County Manager
Clyde Albright, Attorney
Craig Honeycutt
Marlena Isley, GIS Director
Robert Key, Director of Inspections
Sherry Hook, Human Resources Director

Alamance County Board of Commissioners
Amy Scott Galey, Board Chair
Bill Lashley, Vice Chair, County Commission
Bob Byrd, Commissioner
Eddie Boswell, Commissioner
Steve Carter, Commissioner
Tim Sutton, Commissioner

Alamance County Emergency Management Office
Debbie Hatfield, Emergency Management Coordinator

Alamance County Emergency Medical Service
Teresa Harvey

Alamance County Fire Marshall's Office
John Payne, Fire Marshall

Alamance County GIS
Katherine Liles, Interim Planning Director

Alamance County Historic Properties Commission
Jessica Dockery, Planner

Alamance County Planning Department
Rodney Cheek, Chair
Tonya Caddle, County Planner

Alamance County Sheriff's Office

Terry Johnson, Sheriff
Cliff parker, Chief Deputy

Chatham Town Council

William Pace, Mayor

City of Burlington

Robert Patterson, Jr., Water Resources Director
Todd Lambert, P.E., City Engineer

City of Danville

Joni House, Preservation Coordinator
Kenneth C. Gillie, Jr., Director of Community Development
Telly Tucker, Director of Intergovernmental Affairs

City of Eden

Angela Hampton, Council Member
Bernie Moore, City Council Member
Darryl Carter, City Council Member
Debra Galloway, Planner
Jerry Ellis, City Council Member
Jerry Epps, City Council Member
Jim Burnette, Council Member and Mayor Pro-Team
Kelly Stultz, Planning Director
Michael Dougherty, Director of Economic Development
Neville Hall, Mayor
Paul Dishmon, Director of Municipal Services
Stephen (Brad) Corcoran, City Manager
Sylvia Grogan, Council Member

Chamber of Commerce

Angela Fowler, President

City of Graham

Chip Turner, Council Member
Frankie Maness, City Manager
Griffin McClure, Council Member
Jerry Peterman, Mayor
Lee Kimrey, Mayor Pro Tem
Melody Wiggins, Council Member
Nathan Page, Planning Director

City of Reidsville

Donald L. Gorham, Council Member
Donna Setliff, Community Development Manager
Harry L. Brown, Council Member
Haywood Cloud Jr, Assistant City Manager
James K. Festerman, Council Member
Jay Donecker, Council Member
Jeff Garstka, Economic Development Director

Preston W. Mitchell, City Manager
Rev. William Hairston, Council Member
Sherri G. Walker, Council Member
Steve Moran, City Engineer
Terresia Scoble, Council Member

Chamber of Commerce
Denise Brady, Membership Director
Diane Sawyer, President

Danville-Pittsylvania County Chamber of Commerce
Betty Jo Foster, Interim President & CEO

Graham Police Department
Tony Velez, Lieutenant

Haw River Police Department
Scott Thomas, Assistant Chief
Haw River Sheriff Department
Toby Harrison, Chief

Haw River Town
Charlie Davis, Attorney

Mebane City
David S. Cheek, Manager

Pittsylvania County
Ben L. Farmer, Board of Supervisors Callands-Gretna District
Charles Miller, Supervisor
David M. Smitherman, County Administrator
Elton W. Blackstock, Board of Supervisors Staunton River District
Gregory Sides, Assistant County Admnistrator for Planning and Development
J. Vaden Hunt, County Attorney
Joe Davis, Supervisor
Karen Hayes, Deputy Director
Matt Rowe, Economic Development Director
Robert "Bob" Warren, Chair, Board of Supervisors
Ronald Scearce,Vice Chair, Board of Supervisors
Tim Barber, Supervisor
Planning Commission
Richard Motley, Planning Commission Chairman

Rockingham County
Carrie Spencer, Planning and Inspections Director
John Morris, Attorney
Lance Metzler, County Manager
Lynn Cochran, Planner
Board of Commissioners
A. Reece Pyrtle Jr., Vice-Chairman

Charlie Hall, Commissioner
Kevin Berger, Chairman
Mark F. Richardson, Commissioner
T. Craig Travis, Commissioner
W. Keith Mabe, Commissioner

County Center
Kerry Taylor- Pinnix, Economic Development

Center for Business and Economic Development
Ken Allen, Assistant Director
Jan Critz Yokeley

Education Foundation
Dawn Charaba, Executive Director

County Government
Rodney Cates, Director of Emergency

Planning Department
Tonya Caddle, County Planner

Sheriff Department
Grey Smith, Captain
Samuel Page, Sheriff

Stoneville Government
Chuck Hundley, Town Council
Jerry Smith, Town Council
Johnny Farmer, Town Council
Kenneth Gamble, Town Manager
Ricky Craddock, Mayor

Town of Green Level
Rodney Gunn, Public Works

Town of Haw River
Buddy E. Boggs, Mayor
Charlie Davis, Attorney
H. Lee Lovette, Mayor Pro Tem
Jeff Fogleman, Council Member
Kelly Allen, Council Member
Melanie Eveker, Asst Finance Officer/Town Clerk
Patty Wilson, Council Member
Sean Tencer, Town Manager
Steve Lineberry,Council Member

Companies and Organizations
1804-1814 Greenstreet Associates
329 Partners, LLC
Robert H. Kluttz, Registered Agent

801 Brooks Rd. Land Trust
Afro-American Historical and Genealogical Society of North Carolina, Inc.
    Lamar E. DeLoatch, President
Alamance Chamber of Commerce
    Reagan Chandler Gural, Vice President
Alamance Community College
    Algie Gatewood, President
Alamance Community College
    Cindy Day Collie, Vice President of Administrative and Fiscal Services
Alamance Community College
    Thomas Hartman, Director of Administrative Services
Alamance County Area Chamber of Commerce
    Mac Williams, President
Alamance County Historical Museum
    William Murray Vincent, Director
Alltech, Inc.
Andrews Memorial Baptist Church
Appalachian Mountain Advocates
    Benjamin A. Luckett
AQ Contracting, Inc.
    Ronald Adams and Cynthia Adams
Archy Grove United Christian Church
AWCK Engineering
    Josh Johnson, Principal Engineer/Project Manager
Baggerly Irrevocable Trust
Bakatsias Solar Land Hldgs, LLC
Belle Grove Church
    Willie Thomas Fitzgerald and Curtis Wayne Galloway, Trustees for Belle Gove Church a/k/a Belle Grove Primitive Baptist Church, Trustees
Belview Baptist Church
Blue Ridge Environmental Defense League (BREDL)
    Mark Barker
Bluebird Trail Farms, LLC
Bryant Properties & Holdings, LLC
Burnt Shops, Inc., R. Henderson Scott, Jr. Family Limited Partnership
    R. Henderson Scott, Jr., President
Cape Fear Workforce Development Board
    Jan Critz Yokeley, Business Engagement Manager
Capital Results
    Shawn Day, Director of Public Affairs
Cardinal Pipeline Company, LLC
Cascade Meadows, LLC
CB Enterprises, Inc.
Centro La Comunidad
    Lucy Rubiano, Family Support Specialist
Church of God of Prophecy
Citizens Economic Dev. Inc.
Civitas Institute
    Donald Bryson, President
Clarence Hale Auto Sales Inc.
    Clarence Hale and Lenora Hale, Jason Todd Hale

Commonwealth Forest Investments, Inc.
Copland Fabrics
Jason Copland, President and CEO
Cox Properties, LLC
Cultural Heritage Partners
Ellen Chapman
Cultural Heritage Partners
Kelli Peterson Attorney at Law
D & W Investment Properties, LLC
Deborah J. Hines
Dan River Basin Association
Jenny Edwards, Rockingham County Project Manager
Dan River Basin Association
Tiffany Haworth, Executive Director
Robin Light, Office & Finance Manager
Danville & Western Railroad
Danville Utilities
Jason Grey, Director
Danville-Pittsylvania County Chamber of Commerce
Alexis Ehrhardt, President & CEO
Danville-Pittsylvania Regional Industrial Facility Authority
Deep Creek Baptist Church
Delta Contracting, Inc.
Duke Power Company
Duke Power Company
Duke Power Company
E S T Enterprises, LLC
Scott Thompson, CEO
Economic Development Partnership of North Carolina
Chris Chung, CEO
Eden Custom Processing, LLC
Eden Public Library
Michael Roche
Eden Rotary Club
Vonda Higgs, Program Chair
Eden Water Department
Environmental Solutions and Innovations, Inc
Casey Swecker, Vice President
Environmental Solutions and Innovations, Inc
Stephanie Frazier, Senior Project Manager
Environmental Solutions and Innovations, Inc.
Taina Pankiewicz, President, COO
EQT Energy LLC
Megan D. Stahl, Permitting Supervisor
EST Enterprises, LLC
Fieldcrest Road Properties, LLC
First Baptist Church of Draper
FLMR Properties, LLC
Foss Rentals, LLC
G&I Properties
Glen Raven Mills, Inc.

GNE Properties, LLC
    Faye Diachenko
Graham Historical Museum Advisory Board
    Elaine Murrin, Chair
Graham Historical Museum Advisory Board
    Jeannette Beaudry, Chair
Greenbrier Pipeline Co., LLC
Greenwood Presbyterian Church
H. S. Nolen General Contractors
Haw River 413 Boundary Street
Haw River Assembly
    Elaine Chiosso, Executive Director
Haw River Assembly
    Emily Sutton, Haw River Watch Coordinator
Haw River Baptist Church
Haw River Business Center, LLC
Haw River HDC I, LLC, Haw River HDC II, LLC, Haw River HDC III, LLC
    Cora Holdings, LLC
Haw River Heritage, LLC
Haw River Historical Society Museum
    Gail Knauff, Director
Haw River Partners, LLC
    Pam Stone
Haw River Sanitary District
High Country Holdings, LLC
Hill View Farms
    Robert Morris Pollok, Jr. and Bille S. Pollok
Hirschler Fleischer
    Joseph Lee Stiles, Esq
Igloo Series II Reo, LLC
Independent Timber, Inc
Innotex Holding USA, LLC
Interstate Investments of Alamance, LLC
Irvine River Company
    Mark Bishopric, President
JDC Manufacturing, LLC
John Robert Kernodle Senior Center
    Judy Whitfield, Senior Center Director
K Farms, Inc.
Keystone Foods, LLC
Knowles Road Trust
Lenox Castle Farms
    William Jarrell Young
Lewis Brothers Farms, LLC
M. Kendall Lumber Company, Inc.
    Vanna Connor, Secretary
M. Kendall Lumber Company, Inc.
Martin Marietta Materials, Inc.
    Brian North
Martin Marietta Materials, Inc.
    Josh Turner

Maxey Properties, LLC
May Memorial Library
Lisa Kodin, Reference Department
Deanna Cunningham, Branch Manager
MBEE Properties, LLC a NC limited liability company
McCandles Performance, LLC
McLeansville Corp.
Melinda H. Coleman, President
Mebane Historical Society and Museum
Traci Davenport, Executive Director
Millercoors LLC
Morningside, LLC
Mountain Valley Pipeline, LLC
Travis Garrett
Moving North Carolina Forward
Tom Hendrickson, Managing Director
NC Manufacturer Extension Partnership
Phil Mintz, Executive Director- Industry Expansion Solutions
Norfolk Southern Railway Co., Property Tax Department
Property Tax Department
Norfolk Southern, Southern Railroad
Herbert Wilson, Real Estate Manager
Normandy Mtg Loan Trust 2016-1
North Carolina Chamber of Commerce
Angela Sutton, Event Sponsorship Manager
North Carolina Chamber of Commerce
Gary Salamido, Vice President, Governmental Affairs
North Carolina Chamber of Commerce
Kate Payne, Vice President, Communications
North Carolina Chamber of Commerce
S. Lewis Ebert, President & CEO
North Carolina Economic Development Association
Lawrence Bivins, Managing Director
North Carolina Natural Heritage Program
Laura Robinson, Botanist
Misty Buchanan, Director
North Carolina Railroad Company
North Carolina Museum of Natural Sciences
Patricia (Trish) Weaver, Collections Manager, Geology and Paleontology
Lisa Herzog, Operations Manager, Paleontology
PFJ Southeast, LLC
Piedmont Triad Partnership
Jed McMillan, Vice President, Government Affairs
Piedmont Triad Partnership
Penny Whiteheart, Executive Vice President
Piedmont Triad Partnership
Stan Kelly, President & CEO
Pittsylvania County Public Library
Jennifer Arthur, Branch Manager
Pittsylvania Historical Society
Larry Aaron, President

Pittsylvania Historical Society
Mary Plaster, President
Protect Our Water Heritage Rights (POWHR)
Russell Chisholm
Ranch Properties, LLC
Reidsville Public Library
Michael Roche, Library Director
Reidsville Rotary Club
John Kolessar, President
Remnants and Textiles, Inc.
Revolution Properties Holdings, LLC
Rock Solid Hardscapes, LLC
Rockingham Community College
Mark Kinlaw, President
Rockingham County Center
Adam Mark, Economic Development
Rockingham County Center for Economic Development
Leigh Cockram, Director of Economic Development and Tourism
Rockingham County Historical Society
Jordan Rossi, Executive Director
Sandy Creek Trail, LLC
Beverly S. White and William S. White
Sandy Oaks Farms, LLC
Brian Lavinder, Registered Agent
Scott Associates
Mike White
Second Partners, LLC
Sierra Club
Caroline Hansley, Organizer, working with the Beyond Dirty Fuels campaign
Smith Family Irrevocable Trust
Sonim, LLC
South Rock Farm, LLC
M. Denise Booth
South Rock Farm, LLC
Tina Pinnix-Broome
Southern Environmental Law Center
Geoff Gisler, Staff Attorney
Southern Railway Co.
Southwestern Virginia Gas Company SCC
Hershel Michaels
Spencers, Inc. of Mount Airy NC
Stone Street Development, LLC
Tall Timber Holdings, LLC
Textile Heritage Museum
Jerrie Nall
Thomas Weaver Construction Company, Inc.
Transcontinental Gas Pipeline Company, LLC
Jim Hutchins
Transcontinental Gas Pipeline SCC
Truby Drive Realty, LLC

United States Cellular Corporation, A Delaware Corporation
Virginia Chamber of Commerce
Barry DuVal, President & CEO
Virginia Economic Development Partnership
Christy Morton, Vice President, External Affairs
Virginia Economic Development Partnership
Jason El Koubi, Executive Vice President
Virginia Economic Development Partnership
Stephen Moret, President & CEO
Virginia Oil and Gas Association
Ian Landon
Virginia Petroleum Council
Miles Morin
Virginia Speleological Survey
Mike Futrell, GIS/DB Manager
Virginia-North Carolina Piedmont Genealogical Society
Diane Barbour, Publicity Chair/Immediate Past President
Watts for Congress
Willow Oaks Plantation, LLC
Wolf Island Forestry, LLC
Kenan C. Wright
Z Trans Property, LLC
Igor Nikolovski

Landowners and Individuals

Adam J. Harper
Aimee Smith Tilley and Stephen Edward Smith, II
Estates of Steve E. Smith and Michael David Hardingham
Alan Dale Toler and Sharon B. Toler
Alan Lewis
Alan Lynn Pike and Debra Lovelady Pike
Albert Billie Troxler and Barbara Troxler
Albert Johnson, Sr.
Alfred O. Smith
Alice Doraine B. Shropshire
Allen R. Gardner, Nancy F. Gardner, and Gladys M. Frazier
Allen Scott Mitchell and Cynthia C. Mitchell
Alvin Herbin and Virginia B. Herbin
Alyssa Hamilton and Penny Jones
Amanda D. Bailey and Justin C. East
Amanda M. Roach
Anderson M. Jones and Elizabeth Jones
Andrea Brown
Andrea D. Boothe
Andrew N. Johnson and Wilma Anne Johnson
Angela Marie Hinton
Angela Parham
Angelica Covarrubias
Anglia Gail Reavis
Ann Hilton-Huffsmith
Anna H. Wingate
Anne Lane
Anthony Ray Mull
Anthony Settle, Alphony Settle, Carol J. Cummings and Maxine Settle
Anthony W. Jones and Kellie R. Jones
April Marie Stanfield and Ronald Stanfield
Ardell Harrison
Arnie Thomas Roberts and Martha Roberts
Arthur Brunner and Ann Wegmann
Arvin Van Lemons and Joyce M. Lemons
Asure Grisales and Ellen E. Grisales
Auman French and Pamela B. French
Avet Anderson
B. F. Blanchard and Debra D. Blanchard
B. W. Walker and James R. Walker
Baltazar Cruz and Bonnie R. Cruz
Bambi Farris Hutchinson
Bambi L. Lima and Raymond S. Lima
Barbara B. Perkins
Barbara Booth Hand
Barbara Linville Rebb
Barry Giles Hyler and Katherine Shelton

Hyler
Barry Justin Cochran and Deborah Vernon Cochran
Barry S. Frank
Bart Allen West and Rene Lee West
Beatrice B. Hornaday
Beatrice Evelyn Cochran
Belinda Beeson
Belwood L. Hyler
Ben Edwards
Benjamin A. Luckett
  Appalachian Mountain Advocates
Benjamin Joel Andrews and Kimberly Russell Andrews
Bennie L. Anderson
Bernadette Tillman
Betty Williams
    General O. Totten Estate c/o Betty Williams
Betsy Jane Jackson
Beulah Kay Danieley and Jesse Steven Gwynn
Bill Hunt
Bob Costa
Bobby Cox
Bobby Daniel Chambers and Wendy Carol Cain Chambers
Bobby Franklin Wall and Lavalon C. Wall
Bobby G. Brown and Peggy W. Brown
Bobby Ray Smith and Catherine Barker Smith
Bobby W. King and Linda C. King
Bonnie Apple Robertson
Bonnie Jean Quanah Colon
Bradford I. Evans, Jr.
Brandon Collins
Brandon Brewer and Crystal Brewer
Brenda Clark
Brenda N. Searcy
Brenda S. Strickland and Glenn C. Strickland
Bret L. Stevens, Jennifer M. Stevens and Timothy G. Stevens
Brian Edward Workman and Misty Renee Workman
Brian N. Kelly and Amy M. Kelly
Brooks Miller
Bruce D. Taylor and Susan A. Taylor
Bruce E. Smith
Bruce W. Forbes and Nancy A. Forbes
Bryan M. Wagoner and Michele F. Wagoner
Bula Fay Conner
Byron Lee Moose
Calvin C. Montgomery and Fran T. Moore
Calvin Timothy Collie
Camden Whitehead and Betty W. Whitehead
    Betty W. Whitehead Revocable Trust
Cantelmo Family Irrevocable Trust c/o John R. Cantelmo
Carelton Bass
Carlton Dillard Estes and Janice Estes
Carlton Vaden Morton and Betty Brown Morton
Carol A. Giuliani
Carol Christopher Oliver
Carol H. Emerson
Carol Jean Metcalf
Carol Jean Presnell
Carol Miles Headen and Dan Headen
Carol Williamson Oakes
Caroline Franklin Holliday
Carolyn Harrison
Carrie A. Johnson and William Christopher Reid
Carrie Brown Massey
Carrie Louise G. Smith
Catherine R Wilkerson and Brock M. Wilkerson
Catherine R. Norville et al
Cathy L. Wilson
Cecil Wayne Corum and Brenda D. Corum
Chad E. Rhodes and Shannon A. Simpson
Chad Everett Soyars and Chandra Lynn Soyars
Chad Matthew Randleman
Charissa L. Evans
Charles A. Jones and Deborah A. Jones
Charles B. Mann and Rayanne S. Mann
Charles C. Hylton and Sandra W. Hylton
Charles Danny Lynn
Charles E. Clemmons and Pamela H. Clemmons
Charles Kevin Harris and Angela C. Harris
Charles S. Bumbarner and Elizabeth Bumgarner
Charles S. Clarke and Melissa H. Clarke
Charles William Setliff and Angela Carpenter Setliff
Charlie Thomas Crane
Charlie Worth Lee, Jr. and Brenda Worth
Chelsea H. Corum and Betty J. Carter
Cheryl K. Smith
Cheryl Turner

Chris Edmund Yates and Patricia Anne Donoghue
Christen Scott Wood and James Craig Wood
The Scott Family Irrevocable Trust Agreement
Christie Oliver Oakley
Christine Apple Turner and Thomas Barry Turner, Jr.
Christopher A. Rogers
Christopher Cochran and Frances Cochran
Christopher E. Caddis and Marlo R. Caddis
Christopher G. Powell,Trustee for the Samuel C. Powell Irrevocable Trust & Karen Powell
Christopher Michael Faulkner
Christopher P. Johnson
Christopher P. Maltby
Christopher R. Blair and Anna F. Blair
Christopher T. Benkosky and Jennifer L. Benkosky
Christy Barefoot
Cindy Lou Smith Clark and Elizabeth Ann Bailey
Clara H. Jennings
Clarence E. Piper
Clarence Haymore, Jr.
Claude S. Whitehead
Claudia Belfield
Clayton C. Murphy
Connie R. Mullis
Constance Dickerson and Randy Steven
Cornelius Howlett and Linda Lou Y Howlett
Coy B. Frith, Jr.
Craig Drye
Cruciger
Curtis S. Millner
Cynthia C Cobb
Cynthia King Smith Mance
Cynthia Mae Caudill Cobb, Kenneth W. Cobb and Teresa Cobb Massey c/o Teresa Cobb Massey
D. Dale Page and Sue Brooks Page
D. L. Motley
Dale Frank Tate
Dale L. Proffit and Linda C. Proffit
Dale Ray Combs and Jean W. Combs
Dana H. Sparks
Daniel A. Hughes and Margaret M. Hughes
Daniel Garrett, Janice Garrett and David Hutson
Daniel James Bombardier
Daniel Lee Bates and Emily Talbott Bates
Daniel R. Falk and Anita C. Kuchera
Daniel T. Deutermann and Kelly A. Deutermann
Danny M. Barber
Darrell Hugh Davis
Darrell R. Turner
Darryl D. Pennington and Leigh A. Pennington
Daryl M. Powell and Tina A. Powell and Danny Lee Powell
David and Rene Neff
David and Sharon Middendorf
David C. Dalton and Nancy C. Dalton
David C. Johnson and Karen R. Johnson
David Eugene Fonville
David H. Crane and Joyce J. Crane
David K. Naylor
David Lee Adams and Teressa H. Adams
David Lee Harbour and Nancy Ann Denny
David M. Edwards and Linda L. Edwards
David M. Hughes
David N. Smith and Pamela C. Smith
David Neal Guill and Wanda B. Guill
David Nelson Cox and Sue Nash Cox
David P. Hensley
David R. Mehalko
David Travis
David W. Stowe and Nancy C. Stowe
Dawn Louise Ratliff
Deanna Pinnix Thompson and Stanley Thompson
Debbie Smith
Debra Dayle Driver Blanchard
Deborah Amaral
Deborah L. Bohannon and Betty G. Bohannon
Deborah S. Boothe
Deborah Whittington
DeLane King, Robert King, Sr., and Robert King, Jr.
Delmus S. Broadnax, Bill R. Broadnax & Others
Delores A. Odell
Deloris Poser
Demetria Williamson
Dena A. Lawson
Denise Shotwell
Dennis Lee Hughes and Nancy Hughes
Dennis Scott Harris and Robin A. Harris
Dennis W. Loye and Arlene W. Loye
Dennis Wayne McCollum
Dewey Alton Brown

Dianne E. Adkerson and Boyd W. Adkerson

Donald Clyde Iseley and Phyllis B. Iseley
Donald Deboe and Kim G. Deboe
Donald Eugene Radsick, Jr. and Caron Claudia Radsick
Donald Glenn and Melissa H. Walker
Donald L. Brown and Wilma S. Brown
Donna Buttry Cochran
Donna G. Moser and Brian T. Hamilton
Donnie W. Haymore
Dora Ann Atha
Doris C. Flinchum
Doris C. Gilliam Irrevocable Trust
Dorothy Hamlet
Douglas Settle, Jr.
Duane W. Neal
Dustin and Haley Saul
Dwaine R. Strader, Albert G. Strader et al
Earl B. Horner, Jr. and Ann H. Harris
Earl Melvin Worsham and Joan A. Worsham
Eddie L. Roland and Andy W. Moore
Eddy A. Irving and Jennifer Irving
Edith Kernodle Khateeb
Edna Mae Young
Edward D. Purcell and Norma Jean Purcell
Edward Jay Frisbee and Krystal Siegel Inman Frisbee
Edward Lee Lewis
Efren Salinas and Maria Socorro Guerrero
Elaine Chiosso
Elizabeth Ann McKinney Talley
Elizabeth Holly Ore
Elizabeth Ore and Peter Cowan
Elizabeth Y. Wilkins
  Otis Edward Young Estate & Orak Young Estate
Ella West Bason
  Ella West Bason Life Estate
Ellen S. Roberts
Ellen Willets Turlington and James Anthony Turlington
Elmo Franklin Bridges and Judith Sandridge Bridges
Eloise R. Richardson
Elva Teeters
Emigdio Castro and Humberto Castro
Emily Louise Turner and Christopher Perry Turner
Emma H. McGinnis
Erika Cassell
Ervin Junior King
Estate of Furman E. Coggins and Teresa Ann C. Freeman
Estate of Jeanette G. Hicks
Estate of Mattie N. Harrison c/o Ardell Harrison
Estate of W. H. Matkins c/o Phillip H. Brown
Estate of Walter Sanford Harrison c/o Anna H. Wingate
Esther P. Blanchard
Eunice Kenodle
Evelyn S. Strader, Henry E. Strader, Jr., Sandra K. Strader and Garry D. Strader
Everett Nesbitt Jarrett, Jr.
Faedra Schleif
Fay B. Woods and Sandy E. Woods
Faye Barber-Cook
Faye L. Lowe and Glenn Anthony Lowe
Felix Reymundo Felix
Floyd Dishmon and Ramona Dishmon
Frances Ann Kistler-Gervasio
Frances Anne Kistler
Frances Gwendolyn Page Post
Frances M. Crews and Gail M. Held
Frances S. Gammon
Frances U. Pruitt and Thomas M. Pruitt
Francis D. Grooms and Mary Grooms
Francis M. Martin, Thomas O. Martin and Anna Martin Day
Frank C. Hall and Verlie J. Hall, Trustees
Frank E. Bell and Julian Boyd Bell
Frank Junior Emerson and Mildred W. Emerson
Franklin I. Bass
Fred Allen Vaughn, Jr.
Fred Lehman and Carol Lehman
Fred Preston, III and Fred Preston, IV
Fred Vaughn
Freddie S. Evans and Shirley C. Evans
Freddy Chavez
Furman E. Coggins and Bobby Davis Coggins
G.N. Cochran
Gail A. Brewer and George L. Brewer
Garland Thomas Loy
Garry Michael Faulkner
Gary F. Massey and Mary H. Massey
Gary L. Allred and Robin Allred
Gary Lee Loye
Gary Neil Pennington and Elizabeth Cheek Pennington
Gary Purgason

Geneva Journigan
Geneva M. Carden and Lora C. Davis
George J. Hicks and Jeanette G. Hicks
George T. Freeman and Wanda C. Freeman
George Walter Johnson, III
George Walter Johnson, Jr.
Gerald E. Phaup and Jo Anne A. Phaup
Gerald Franklin Mills and Ratiscqua Tierra-Nicol Mills
Gerald Wayne Stone and Peggy P. Stone
Geraldine Johnson
Geraldine Millner
Glenn Anthony Lowe
Glenn Bozorth
Glenn David Roach
Glenn E. Nordh and Jordan B. Nordh
Glenn L. Cantrell, Gaynell C. Leazer, Janet C. Radford
Glenn R. Chriscoe and Regina W. Chriscoe
Glenna S. Jackson
Gloria H. Allen, et al
Gloria W. Whitfield
Gordon Allen Gunn and Martha Gunn
Gordon Jay Shropshire and Teresa Townsend Shropshire
Graciela E. Cornejo
Gregg Alvin Huffine and Shannon Huffine
Gregory Harold Purdy and Mitzi Joyce Purdy
Gregory J. Gunderson
Gregory Scott Hughes
Gregory Wayne Madren
Gurney E. Montgomery
H. Jackson Lee
Harold H. Tate and Peggy W. Tate
Harris Lee Taylor and Frances A. Taylor
Harry Do Welker, Jr.
Harry Lee Carter and Stacy Somers Carter
Harry Phillips
Harry Porterhouse
Harvey Wayne Joyner and Jannice Williams Joyner
Heather Page Morton
Helen S. Moore and William B. Moore, Jr.; Susan C. Moore
Henry Hall
Henry W. Summers and Marsette C. Summers
Henry Wesley Hair and Brenda Foulks Hair
Herbert E. Hooper and Doris Roberts Hooper
Herman C. Johnson
The Herman Colon Johnson Irrevocable Trust of December 2012
Howard Frank Pickrell
Howard J. Shelton and Lana E. Shelton
Howard L. Dunn, Jr. and Patricia L. Dunn
Ilene Byrd and Eve Sharpe
Ilona Flowers
Irye Ray Emerson and Carol H. Emerson
Irye Ray Emerson, Sr.
Issac C. Hill and Brandy A. Hill
Ivey Dunn Gilliam
J. I. Chandler and Irene Chandler
J. Leon Moser and Martha A. Moser
J. Mack Garrison and M. Earl Garrison
J. Scott Sharp and Paige D. Sharp
J.L. Coleman c/o Faye Barber-Cook
Jack Cecil Willis and Margaret L. Willis
Jackie Burris Johnson and Ted Mack Johnson
Jackie Jobe, Annie Burke, et al
Jackie Lee Reese
Jackie R. Thompson and Eldean W. Thompson
Jackie Ray Atkinson
Jackie Ray Atkinson, Jr.
Jacqueline Howlett Aheron
Jake Elmer Wade
James Arthur Quesinberry
James B. Martin and Rachel B. Martin
James C. Trent, Jr.
James Cecil Stone and June C. Stone
James D. Hauser and Kim S. Hauser
James D. Norris
James D. Smith and Carol W. Smith
James Daniel Fleming and Brandy Bright Fleming
James David Browder
James E. Bolden and Mary L. Bolden
James Early Estes
James Edward Laws and Joan Laws
James Edward Powell
James Elmoe Woods
James F. Curry and Pauline K. Curry
James Felix Stanley
James Franklin Richardson
James Henry Law, Jr., Marguerite Law, Life Tenants, et al c/o Laura P. Law
James J. King
James Knapp
James L. Chaney
James L. Howlett Trust
James Leroy Hazelwood and Alma H. Boaze

James Lowell Kernodle and Mary Ann Kernodle
James McAlister, Jr.
James Michael Buckner and Denise E. Buckner
James Michael Powell
James R. Harper
James Reed Barber and Marion Barber
James Robert Lewis
James T. Walker and Brandi M. Walker
James Thomas Brim and Betty Earline Brim
James Trotter Scearce and Wanda A. Scearce
James Wayne Kernodle
James William Walker
Jamie T. Fonville, Jr.
Janelle Austin and Wesley Austin, Sr.
Janette L. Riggan and Laura S. Hale
Janette L. Riggan and Marsha E. Firth
Janice Timpson
Janie Barber Patterson
Jason M. Broyles and Angela N. Broyles
Jay Michael Smith
Jean H. Caldwell
Jean W. Lucy
Jeanne O. Bagby
Jeff Harbinson
Jeffery B. Harrison, Executor
Jeffrey A. Eichinger and Jeanne R. Eichinger
Jeffrey Carr Whitley and Tonia Pillow Whitley
Jeffrey D. Guill and Gena F. Guill
Jeffrey L. Crutchfield and Barbara C. Crutchfield
Jeffrey Lynn Clayton and Angelia Wyatt Clayton
Jeffrey T. Catherman
Jennifer L. Simpson
Jeremy Walker
Jerry A. Beckom
Jerry A. Lewis and Ardenia W. Lewis, c/o Alan Lewis
Jerry B. Blackwell and Elinor Blackwell
Jerry Ben Betterton and Joyce M. Betterton
Jerry E. Farmer
Jerry Lee Warren and Nancy Martin Warren
Jerry Leon Bell and Pricilla Geringer Bell
Jerry Richmond and Penny Richmond
Jerry Robertson Davis
Jerry W. Holyfield and Betty W. Holyfield
Jerry Wayne Martin, Jr. and Rebecca Henderlite Martin
Jesse H. Taylor and Dewey T. Taylor
Jesse J. Carty and Kimberly G. Carty
Jesse James Davis and Cheri Booth Davis
Jesse K. Kendrick and Shirley H. Hendrick
Jessica L. Alcon-Bright and David E. Alcon
Jessica Nicole Waller, Stanley Heath Shelton, Leslie Howard Shelton and Betty Heath Shelton
Jo Ann Parrish Atkinson
Joe Torres
Joel Larry Boggs
John A. Alvis Sr. Heirs
John Andrew Kallam
John Auman Alvis, Sr. and Francis Galimore Alvis
John Brewer and Mary Brewer
John G. Mitchell and Phyllis H. Mitchell
John H. Winn, Jr. and Tracy L. Winn
John Herold and Anne Cassebaum
John Inge
John Morton Glenn and Mary Leigh Copeland Glenn
John N. Hester, III et al
John O'Keefe
John P. McMichael and Susan L. McMichael
John R. Schwarz
John Ray Cole and Ravonda Lynn Cole
John Thomas Berry, Jr. and Dorothy C. Berry
John Thomas Hyler and Elizabeth Smith Hyler
John W. Craddock, Jeffrey E. Craddock and Kenneth M. Craddock
John W. McCollum and Ruth M. McCollum
John Wilbur Ring
Johnnie W. Foster, Sr. et al.
Johnny C Porter and Margaret D. Porter
Johns M. Martin and Johnnie M. Martin
Jonathan D. Hall
Jonathan L. Glenn
Jonathan N. Hollie and Christina R. Hollie
Jordan Delano Simmons and Patricia B. Simmons
Jose A. Zamora and Tammy B. Alverez
Joseph Erwin Gant
Joseph Garvin Sutliff
Joseph R. Jacaruso and Susan M. Jacaruso
Joseph Williams and Dina Williams
Joyce C. Vaughn Revocable Trust
Joyce F. and James G. Anderson
Joyce Hyler Marshall
Juanita M. Howlett

Judith Sandridge Bridges
Judy M. Johnson
Julian W. Robertson et al
Julie Wynn Snead
June T. Soyars
Junior Franklin McBride and Joyce W. McBride
Justin Tuggle and Kelly Tuggle
Justin William Smith
K. Raney
Kalyn Hamilton
Karen Amos Hodnett
Karen B. Maute
Karen L. Taulker
Karen M. Harris
Edna Whitlow Revocable Trust
Karen M. Harris and Joseph L. Clark
Karen McMasters
Katherine Fox
Katherine V. Bayless
Kathleen M. VanDerHyde
Kathryn Knapp Collins
Kathryn M. Nicholson
Kathy Crutchfield Nelson and Jeffrey Davis Nelson
Keith C. Hylton, Sr. and Linda B. Hylton
Keith L. Miller, Jr. et al
Kenneth D. Hawkins and Teresia E. Hawkins
Kenneth Hall and Margaret Evelyn South Hall
Kenneth L. Hudson and Patricia A. Hudson
Kenneth R. Hayes and Teresa G. Hayes
Kenneth W. Bates
Kenneth Wayne Bates, Kenneth W Bates, II and David Lee Bates
Kevin Paul Cobb and Christina Rene Cobb
Kevin W. Hogsed and Jane Turner Hogsed
Kim F. Umstadter
Kimberly L. Capps and Alan G. Capps
Kimberly Michelle Kellam and Carol Lavone Kellam
Kyle O. Garner and Sherri S. Garner
Lacosta J. Hayes and Roger D. Hayes
Lacy Allen
Larry B. Kessler
Larry D. Shambley and Donna S. Shambley
Larry Johnson & Julia R. Johnson
Larry K. Thacker and Judy B. Thacker
Larry Lee Denny and Christine L. Doss and Brad Lee Denny
Larry Wayne Pinnix
Laura K. Palmer
Laurence Tipton
Laury M. Hayes
Lawrence E. Hylton and Robin B. Hylton
Lee C. Carr
Lee Nathaniel Johnson and Abby Dalton Johnson
Leila Wright
Lelia H. Brown
Lelia Jones Tranbarger
Len McCauley
Lenore G. Zamora
Leonard T. Johnson, Jr.
Leonard W. Strickland and Doris O. Strickland
Lewis B. Aldridge and Barbara Aldridge
Lewis E. Dishmon and Kay S. Dishmon
Lib Hutchby
Linda Gail Mckinney Kennedy
Linda Rosborough
Maxine K. Rosborough Estate
Lisa B. Shorter
Lisa Rudine W. Gillie
Lisa Rumley Conklin
Lloyd C. Duffey and Deborah Y. Duffey
Lloyd G. Tucker and Faye Isley Tucker
Lonnie and Patricia Seibert
Lonnie M. Williams and Michelle L. Williams
Lora A. Carden, Samuel J. Carden, Karen C. Crusberg and Susan C. Parker
Loretta B. Madren
Lori A. Whitfield
Lori D. Webster and R. Alan Dyer
Lori Dyer Webster
Lori Thorn
Lou Ann Harris
Lowell Strickland, Estate and Glenn C. Strickland
Lue Hester Finch
Luther Marshall Cobb, Jr., Steven L. Cobb, Kenneth W. Cobb and Teresa Cobb Massey
Lyn Carlisle
Lynda Dodd Justice
Lynn C. Horner and Lisa J. Horner
Makayla J. Maness and Colby B. Scott
Malcolm Dale Roach and Jeanette R. Roach
Malcolm Dale Roach, Jr.
Margaret Ann McDaniel Estate
Margaret Earlene Odell Estes, Pamela Estes Ragland and Ralph Edward Estes
Margaret H. Paschal

Margaret Katherine Whitehead and Robert Walton McNutt Jr.
Margaret Marie Kendrick Corum Thomas
Margaret W. Smith and Robert L. Smith
Margie P. Manley
Margie Williamson
Estate of Elnora Miles
Marie O. Bass
Marilyn Tucker
George W. Tucker Estate
Marion H. Gwynn
Mark A. Jarrett and Virginia G. Jarrett
Mark Hampton Kennon
Mark L. Faucette, Trustee of the Betty B Faucette Irrevocable Trust, Mary Emogene Faucette
Mark Leatherwood
Mark M. Johnston and Tammy M. Martin
Mark W. Hallman and Gail G. Hallman, Wanda G. Hallman, and Steve Hutchinson
Mark W. Hallman, Jr.
Marsha Blanchard Hicks
Marsha F. Fernandez
Marshall H. Kendall
Martha B. Brown
Martha Diane Soyars
Martha Vernon McCollum and Robert Edward McCollum
Marva Brim Jumper
Marvin E. Hylton and Margaret E. Hylton
Marvin Lee Strickland
Mary and Joe Gant
Mary Barnes Murphy and Clinton Irene Barnes
Mary Ella Scott
Mary Gant
Mary Hardy Betterton
Mary Hyler Fitch and James David Fitch
Mary Mitchell Thomas
Mary Nelson Underwood
Maureen B. Sweeney
Maurice H. Vaughan, Jr. and Lusanna L. Vaughan
Maxine K. Rosborough Estate c/o Nancy Rosborough
Maxine K. Rosborough Estate, c/o Linda Rosborough
Maynard M. Smith and Lois I. Smith
Mel Aldridge and Angela Hinton Aldridge Family Revocable Trust
Melanie J. Ogletree and Larry D. Clark
Melinda L. Smith
Melissa Summerlin Pruitt and Brian Michael Pruitt
Melody Lynn Speaks
Melvin E. Sheckells
Melvin F. Stone and Deborah S. Stone
Melvin S. King
Michael A. Greene and Jane N. Greene
Michael A. Warren and Karen Warren
Michael Brown
Michael Brown and Laureen Brown
Michael C. Bray and Teresa S. Bray
Michael Edison Rascoe
Michael Glenn Wallace and Paula Rochelle Wallace
Michael Harrison
Michael J. Dishmon and Joyce M. Dishmon
Michael Lee Ward
Michael Lewis Neal and Janine R. Neal
Michael Lynn Barnette and Karen Barnette
Michael O. Paschal and Barbara Knowles Paschal
Michael R. Stowe
Michael Robert Comer and Jonna C. Comer
Michael Stephen Madren
Michael Stephen Madren and Patsy Lloyd
Michael T. Benesch and Darlene B. Benesch
Michael Wheeley and Wanda Wheeley
Michele Aust
Michele P. Moon
Michelle T. Kennon and Melissa Kennon
Mildred W. Emerson, Clarence A. Emerson, Jr. and Robin K. Emerson
Milton Dickerson and Sherrie Darlene Dickerson
Minnie Lee Cox
Mitch and Stephanie
Mitchell M. McEntire and Virginia McEntire
Mogan Blanchard Thompson
Munsey R. Jones and Judieth W. Jones
Myra P. Cathey and Anthony Cathey
Nadine L. Maness Life Estate Indian Village
Nancy H. Weatherford
Nancy M. Evans and Sherry Ellen Evans Reynolds
Nancy Roscoe Hughes
Nasser Hallaji and Violet Ann Hallaji
Neil R. Fedin and George Thomas Foster
Nellie Mann and William Franklin King
Nettie A. Woods, et al
Nicole Spiven
Nicole Tafton Balderas and Jose Juan Balderas Camargo

Norma Blakey
Norman Lehnhardt
Noyd Grayson Eaton and Joseph T. Eaton
Otis L. Foster and Louise J. Foster
Owen McKenzie Living Trust and Marta McKenzie Living Trust c/o Butch McKenzie
Pamela J. Muller
Pamela Knowles Isley and William Jerry Isley
Pamela Susan Scott
Patricia Faye Alvis
Patty Johnson Williams
The Herman Colon Johnson Irrevocable Trust of December 2012
Paul Bennett East, Jr. and Samuel D. EastPaul Edward Robertson
Paul Franklin Wilson
Paul G. and Zenella R. Radford
Pearl T. Mansfield
Peggy R. Dishmon
Peggy W. May and Donnie L. Warren
Perry Blancahrd Slade and Jack Daniel Slade
Perry Slade
Pete Witty
Phaivanh Khamdy and Ketmany Khamdy
Phillip Alexander Christmas and Anita Lou Christmas
Phillip D. Hylton and Brenda L. Hylton
Phillip H. Brown
Phillip McCalister and Sheila McCalister
Phillip V. Cantrell and Donice J. Cantrell
Phillip W. Hutson and Susan H. Hutson
Phillip W. Hutson, Sr. and Susan H. Hutson
Phyllis B. Hunter
Phyllis Mitchell
Porter Lee Raines and Katie Travis Raines
Posey W. McBride
R.E. McCauley Heirs c/o Ralph McCauley
R.M. Jordan
Raeford A. Rogers and Janice A. Rogers
Ralph Loeb and Elizabeth H. Loeb
Ralph Lynn Denny
Ralph Robert Swink and Patricia Dewald Hall
Ramona Bankston Millner
Ramona Faye Millner
Randall and Janna Smith
Randy Alan Bryant
Randy C. Kernodle
Randy E. Bright and Yvonne H. Bright
Raven Lee Broeker and Cathi Jo Broeker
Ray Schaffer
Raymond Carl Thomas
Raymond D. Shisler and Anna M. Shisler
Raymond Devine and Michael L. Devine
Raymond L. Pankratz and Rebecca A. Pankratz
Raymond William Batterman, Jr.
Rebecca B. Devette
Rehwick G. James and Phyllis Rivers James
Reid N. Oakley and James Lynn Oakley
Reid Nash Oakley
Renee Womack
Rex R. Paschal and Bernice Paschal
Richard Belton and Darlene Belton
Richard G. Motley and Reva A. Motley
Richard Garner and Deborah Garner
Richard K. Lowe
Richard L. Rust and Lori R. Rust
Rick King
Rickie S. Manuel
Ricky Dale Jones
Rinda G. Brewbaker
Robert and Marcia Cauthren
Robert Andrew Cagle
Robert B. Stump
Robert Benton Dishmon
Robert C. Teeters and Elva Teeters
Robert C. Warren, Jr. and Lena Kay Warren
Robert Charles Welch Basler and Jami Basler
Robert F. Brown and Karen V. Brown
Robert F. Rhodes
Robert F. Woody, Jr.
Robert H. Gillespie and Estelle Matherly Gillespie
Robert J. Mullis and Connie R. Mullis
Robert L. Carter and Peggy G. Carter
Robert Lee Martin, Jr. and Carolyn Estes Martin
Robert M. Walker and Elizabeth Walker
Robert Matthew Overby and Kathleen M. Overby
Robert Morris Pollok, Jr.
Robert R. Bennett and Mary C. Bennett
Robert S. Fonville
Robert T. Lunsford and Karen M. Lunsford
Robert Travis Mullen
Robert W. Hensley and Mary H. Hensley
Robert William Pollok
Robert Woodson Smith and Carol S. Smith
Robin Denise Morrow
Robin T. Mullins and Rodney E. Turner
Roderick Miller

Roger D. Moser and Tammy C. Moser
Roger H. Sisson and Marie L. Sisson
Ronald David Smith, Jr. and Johanna C. Smith
Ronald Eugene Turner
Ronald K. Ward and Doris H. Ward
Ronald M. Jordan II
Ronald Michael Jordan, II
Ronnie James Snowdy and Kimberly L. Snowdy
Roscoe D. Anderson Estate c/o Eric C. Anderson
Roy L. Tranbarger and Lelia Jones Tranbarger
Roy R. Loftis and Judy J. Loftis
Roy Vanderhyde and Kathleen M. VanDerHyde
Ruby Hardin
Ruth Moore
Ruth S. Anderson
Ruthie Mae Johnson
Sadee Allen
Sam Bobby Stallings and Jean G. Stallings
Sam L. Coleman and Linda H .Coleman
Samantha Parsons
Samuel Elliott Benton
Samuel Eugene Benton and Deborah Saul Benton
Samuel J. Adkins and Christie O. Adkins
Sandra D. Payne
Sandra Madren Shoe
Sandra Thomas Jones
Sarah Faucette
Scot M. Gilbert and Louise M. Gilbert
Sean Leigh Moore and Lisa Moore
Seth Trevis Edwards and Whitney Poole Edwards
Sharon Patsy Patterson
Shawn Dwight Simpson and Karen Renee Firth
Shawn Gorman
Sherry B. Gunn
Sherry W. Burris and Ken Whitesell
Shiloh Daum
Shirley B. Baggerly
Shirley McCain Miller
Silvia L. Sandoval
Stella H. Emerson
Stephen D. Joyce and Autumn S. Joyce
Stephen P. Wilson
Steve E. Smith and Michael David Hardingham
Steven D. Allen
Steven D. Cannon and Tambitha P. Cannon
Steven L. Cobb and Cynthia Cobb
Steven L. Coleman and Debra C. Coleman
Sue I. Tipton and Laurence W. Tipton
Susan J. Tucker
Susano B. Jaimes
Sylvia Hutson Cusumano and Linda Hutson Green
Sylvia Suriani
Taftan Nicole Balderas
Takwana Stout Hopkins
Tammy Ann Hale
Tangela D. Williams
Taylor Scott Wilson
Terry Haith
Terry J Powell et al c/o Conrad Powell
Terry J. Blackstock and George L. Blackstock, Jr.
Terry Wayne Sawyer
The Allens
Thelma C. Bell
Thomas D. Newcomb, Jr.
Thomas De Wayne Brim and Monique Moore Brim
Thomas E. Annas
Thomas E. Echols, Ronnie W. Echols, Timothy K. Echols, and Norris E. Echols
Thomas E. Marsh
Thomas E. Tomerlin and Frances B. Tomerlin
Thomas Hiatt and Thomas Richard Hiatt
Thomas Michael Edwards
Thomas O. Martin and Amy G. Martin
Thomas R. Buccier
Thomas R. Wangard and Janice U. Wangard
Thomas S. Stump and Kathryn F. Stump
Thomas W. Pritchett and Lydia P. Brincefield
Tiffney Renee Jones
Tim Hamilton
Timothy Duke Roney c/o Carol Roney
Timothy L. Shelton and Elaine K. Shelton
Timothy M. Hale and Michelle P. Hale
Timothy Mark Barber and Danny Madison Barber
Timothy W. Moore and Patricia S. Moore
Todd H. Whitt and Joyce F. Whitt
Todd Sherrill
Toni D. Deaton and Tangela D. Williams
Tony D. Estes and Christina Estes
Torrey L. Roach and Amanda R. Roach

Torry and Amy Roach
Tracey A. White
Travis Garrett
Trenton James Bowman
Trevor Wayne Hale
Trojan Smith and Suzanne Smith
Valerie Mae Stone
Vallie H. Wagoner
Van W. Walker
Velma Lorene Haynes Hutson
Velma Samuel Adkins Heirs c/o John R. Adkins
Vera Kernodle Bullock
Vernon Allen Morris, Jr. and Karen Rudd Morris
Vernon S. Wilson and Cora Marie Wilson
Vince DiGirolamo
Virgil Alexander Cochran
Virginia Ann Jones Wilmouth
Virginia B. Sharpe, et al
Virginia D. Moore
Virginia Mitchell Smithers and Allen Scott Mitchell
Vivian Parsons Parrish
W. Garland Lynn and Susan Lynn
Wade L. Ray and Amber L. Ray
Wallace D. Dishmon and Patricia W. Dishmon
Walter Donald Gerringer and Tammy Haizlip Gerringer
Walter E. Vanhorn and Patricia S. Halley
Walter H. James and Tracey W. James
Walter H. James and Tracey W. James and Byron Lee Moose
Walter James
Walter L. Romine and Tammi H. Romine
Walter Randall Weddle
Walter Sanford Harrison, Jr.
Wanda H. Overby and J. Pete Overby
Wayne B. Perry and Doris R. Perry and Wayne B. Perry, Jr.
Wayne Hilliard Gillie
Wayne P. Rose and Donna T. Rose
Wayne S. Apple
Wendy P. Snow and Robert Lee Pruitt
Wesley T. French and Kristi M. French
Wetona Inez Moore
Willard L. Williams
William A. Emerson, II
William A. Lineberry
William Brian Chapmon and Meredith Lee Chapmon
William Clifford Steele, Jr.
William E Slade and Kay D. Slade
William G. Dougherty and Teresa D. Parks
William G. Williams and Margaret Williams
William H. Fonville and Jill Fonville
William H. Fonville Family Revocable Trust
William H. Johnson and Geraldine Johnson
William H. Rogers, Jr. and Judith R. Rogers
William Henry Price, Jr.
William Holt Boone and Wilma Byrd Boone
William I. Crabtree and Carolyn W. Crabtree Crabtree Family Irrevocable Trust
William Jerry Fonville, Jr.
William Jerry Fonville, Jr. c/o Belinda Beeson
William K. Strader
William K. Tapscott and Roxanne O. Tapscott
William Leonard Merritt
William Lynwood Irving
William M. Hales and Lisa S. Hales
William Melvin Pickrell and Mary Ann Pickrell
William Michael Spain and Ashley Nicole Hardy
William R. Lowry
William Roger Cobb, Jr.
William Roger Moore and Fran T. Moore
William S. Jones et al
William Seth Rascoe
William Simpson and Wanda Simpson
William T. Strickland and Ellen S. Roberts
William Timothy Walker
Wilma Anne Johnson and Andrew Nathaniel Johnson
Xanthan William Lee and Charmin Britt Lee
Yesica Becerra
Yvonne Martin Whitt
Zachary Michael Neefe and Elizabeth Seaks Neefe
Gladys Geneva King Life Estate
The Jimmy H. Coble Revocable Trust dated April 13, 2000

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APPENDIX B.1

Southgate Project Maps

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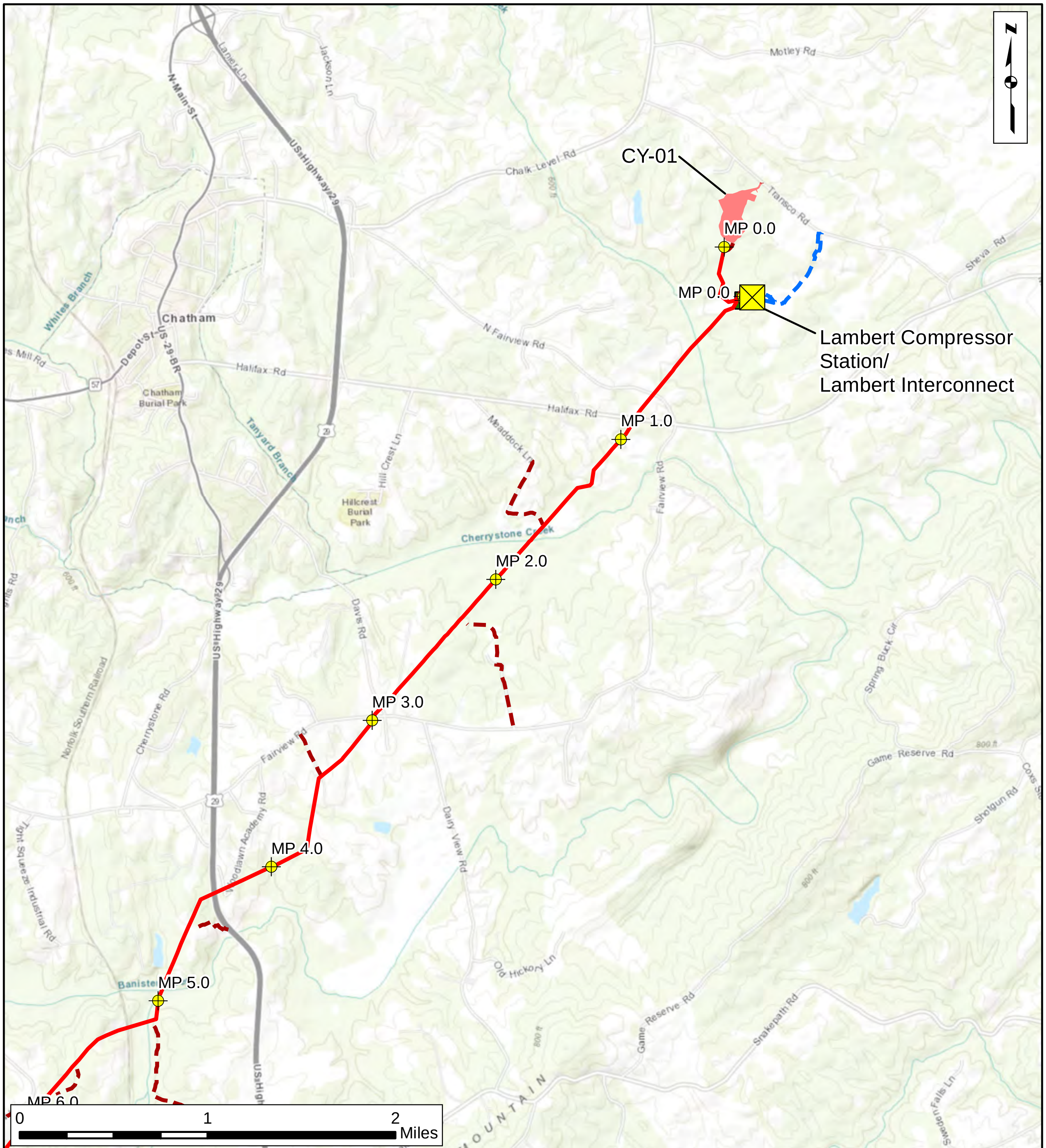

Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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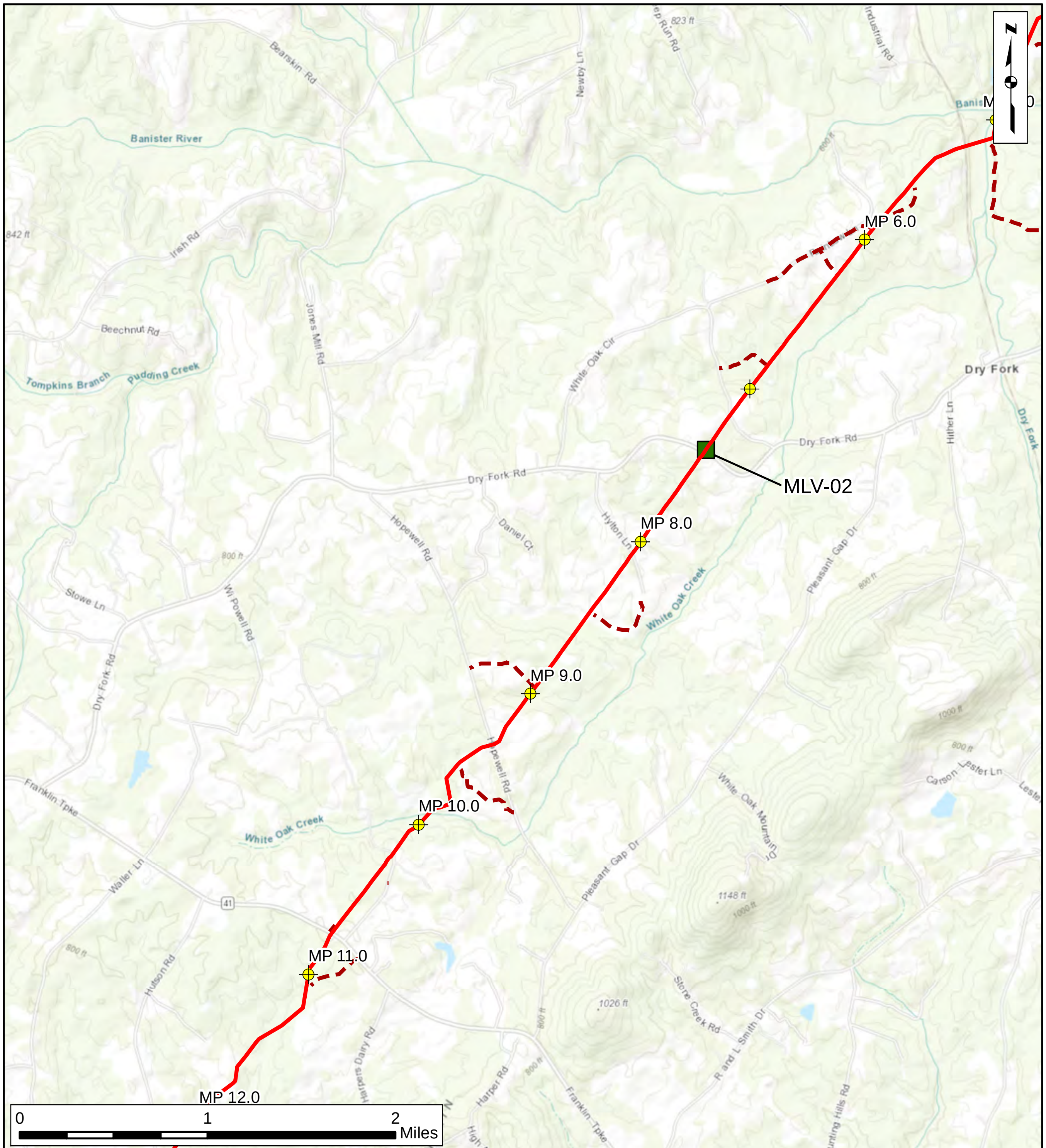

- Milepost
- Proposed Pipeline Route
- Permanent Access Road
- Temporary Access Road
- Mainline Valve
- Yard
- Meter Station/Interconnect
- Compressor Station

Appendix B.1

Southgate Project

Project Overview Map

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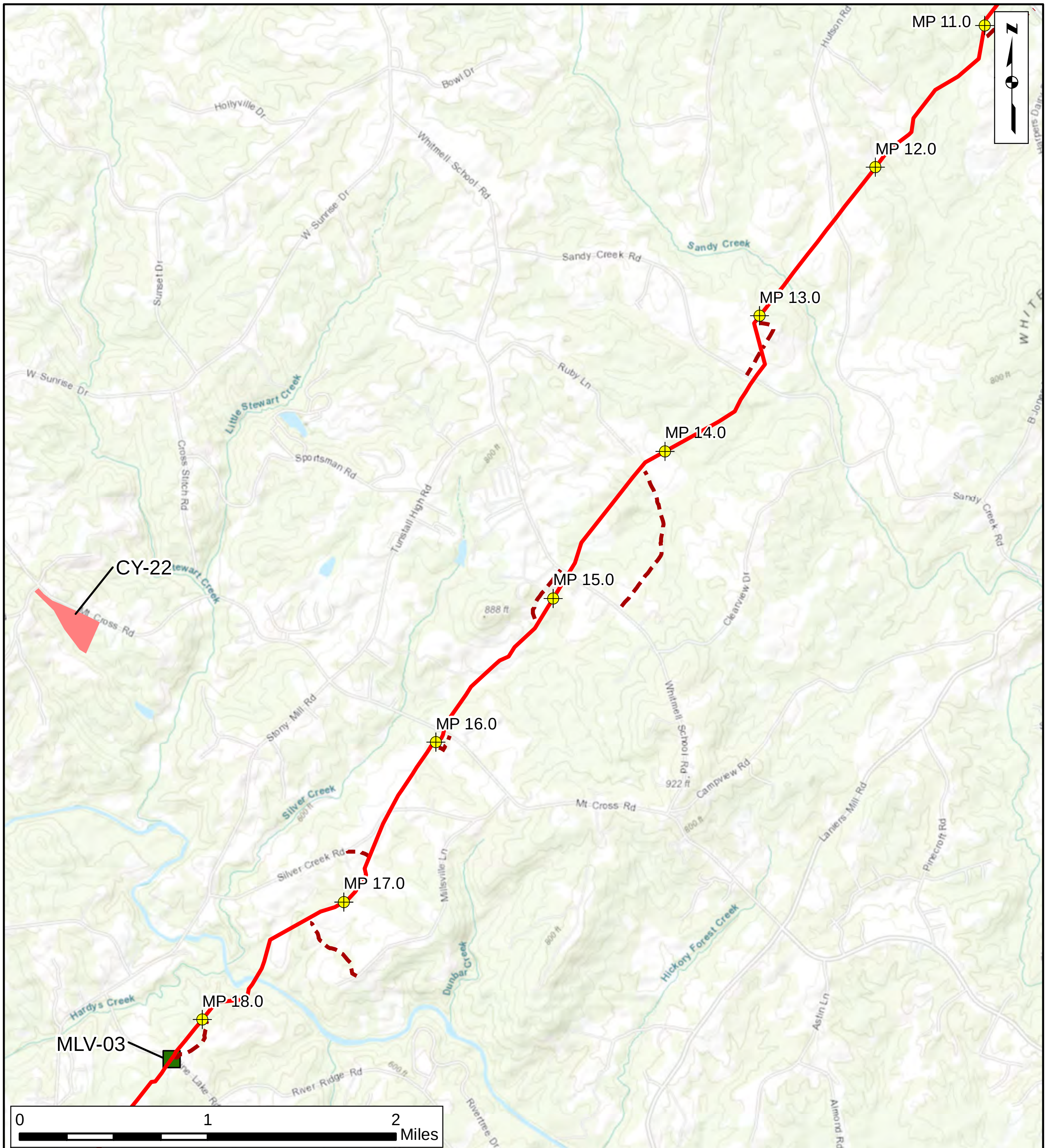
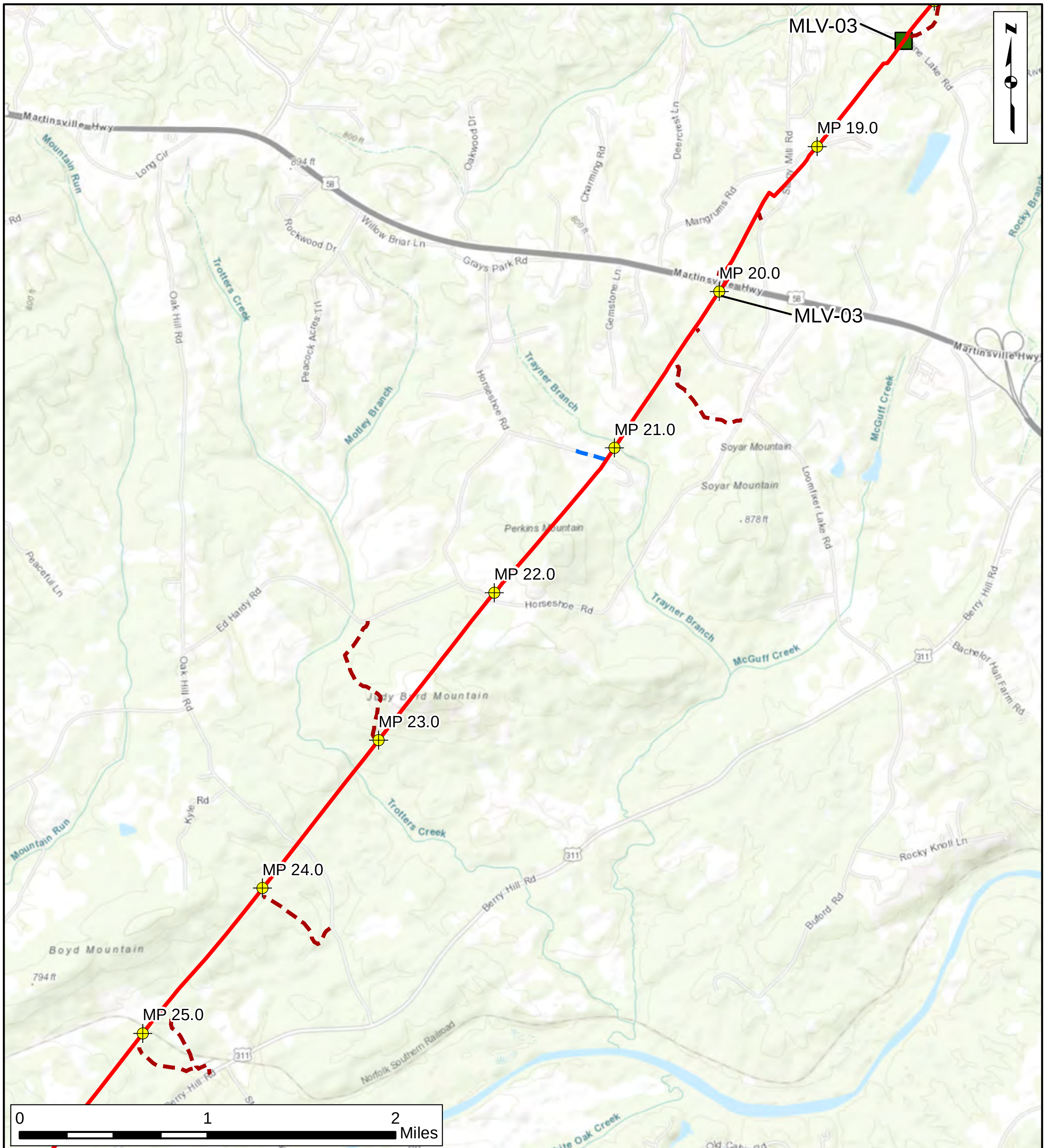


Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
Page 3 of 14



Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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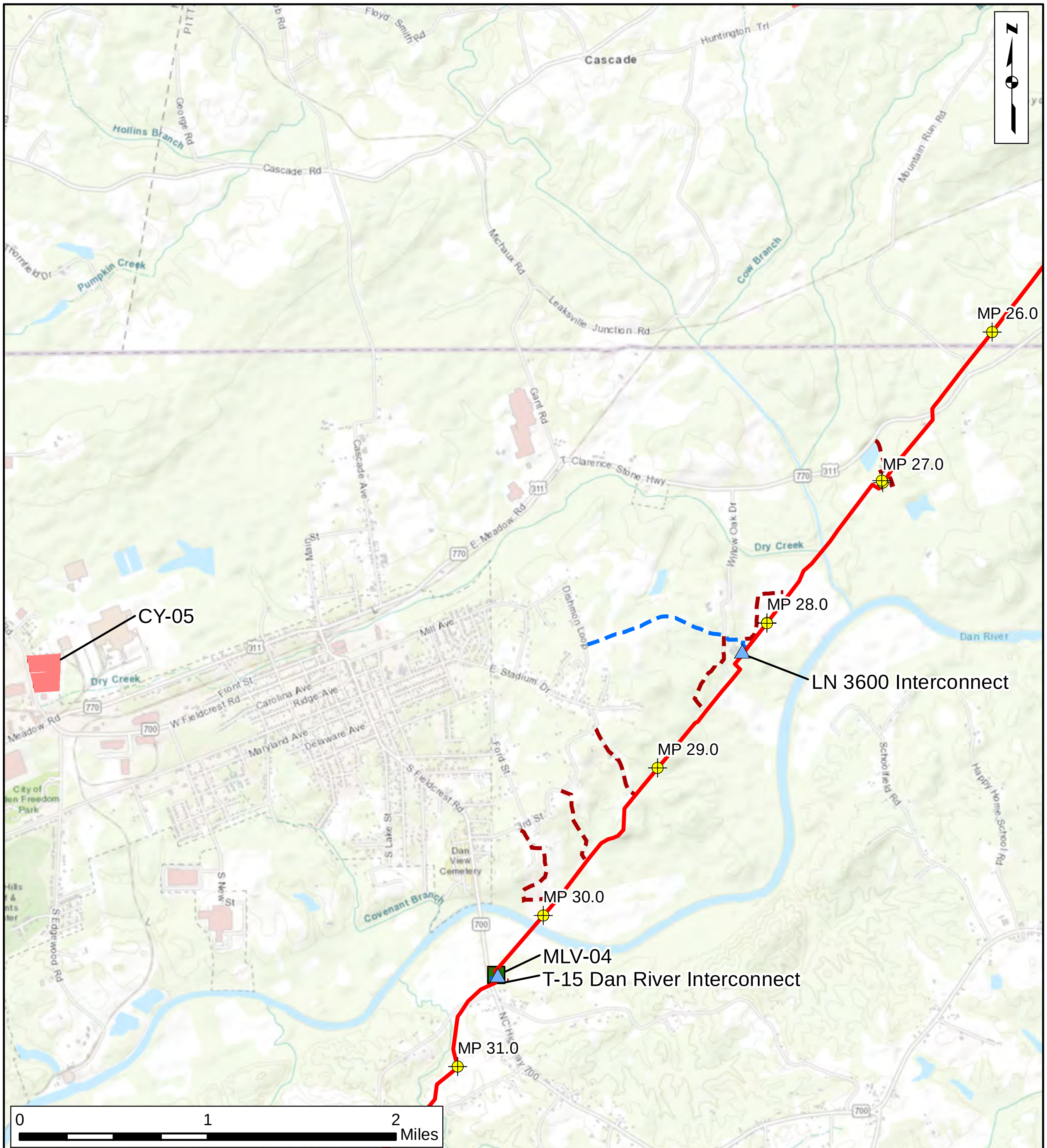

Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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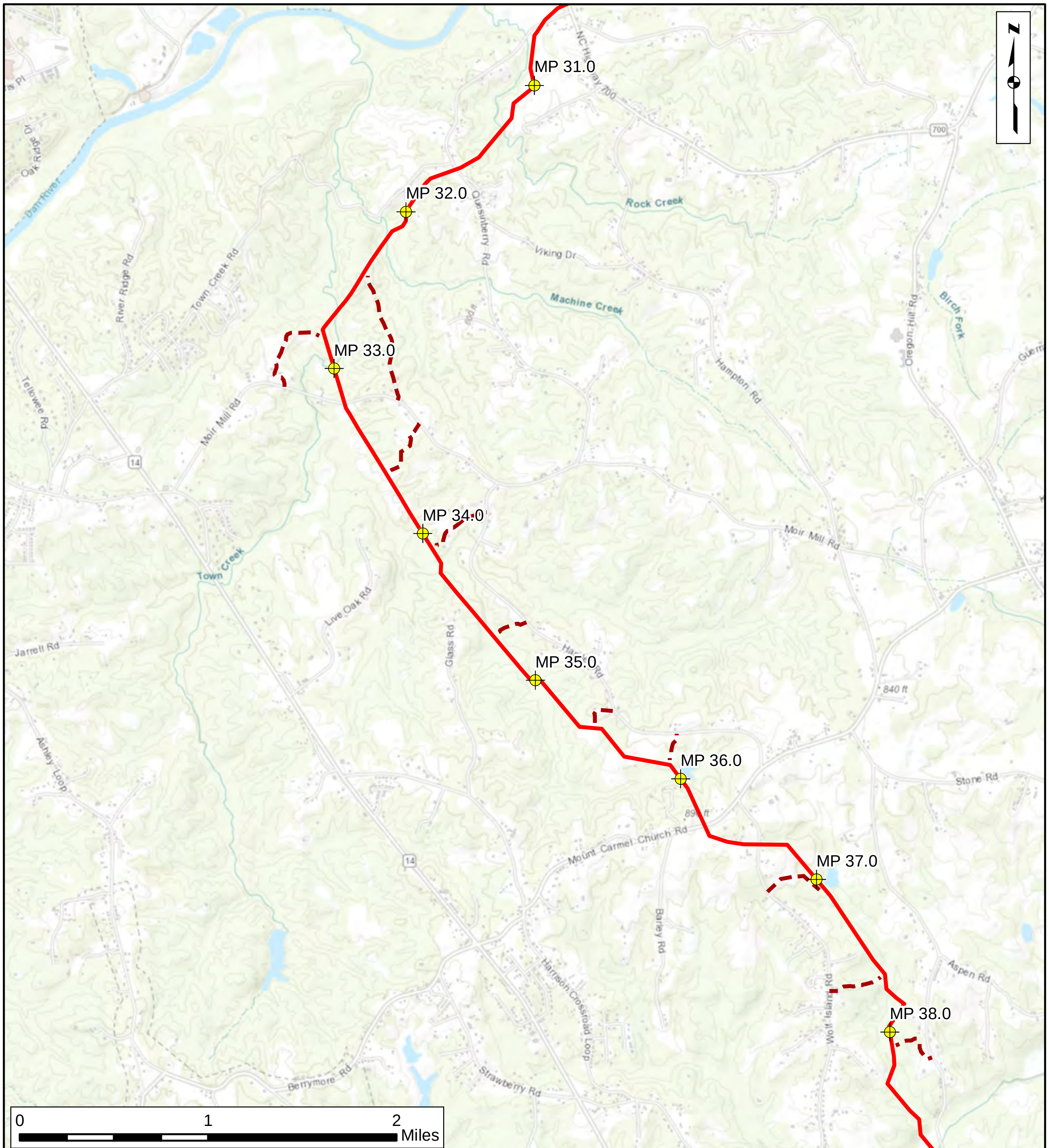

- Milepost
- Proposed Pipeline Route
- Permanent Access Road
- Temporary Access Road
- Mainline Valve
- Yard
- Meter Station/Interconnect
- Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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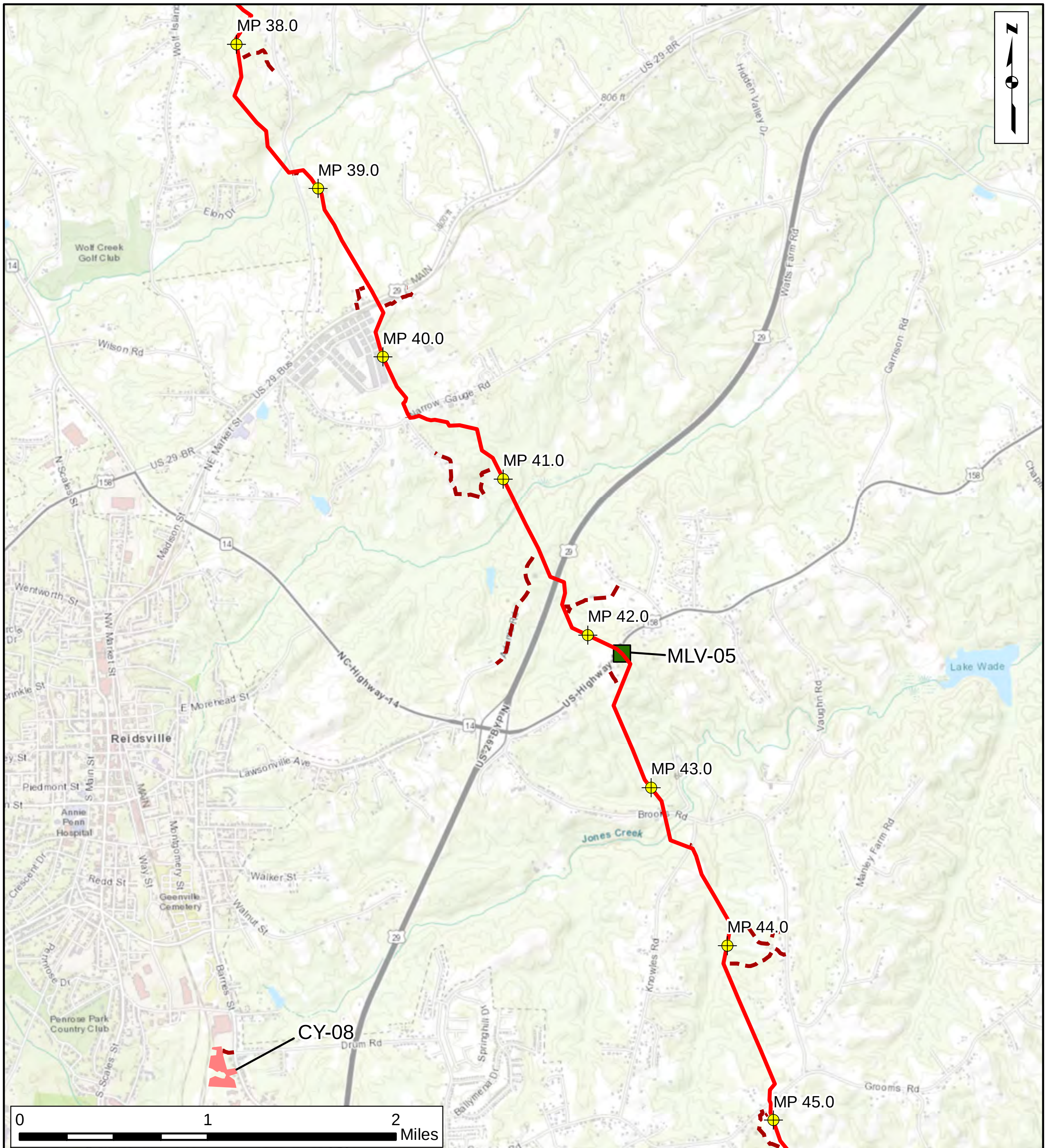

Milepost	Mainline Valve
Proposed Pipeline Route	Yard
Permanent Access Road	Meter Station/Interconnect
Temporary Access Road	Compressor Station

Appendix B.1

Southgate Project

Project Overview Map

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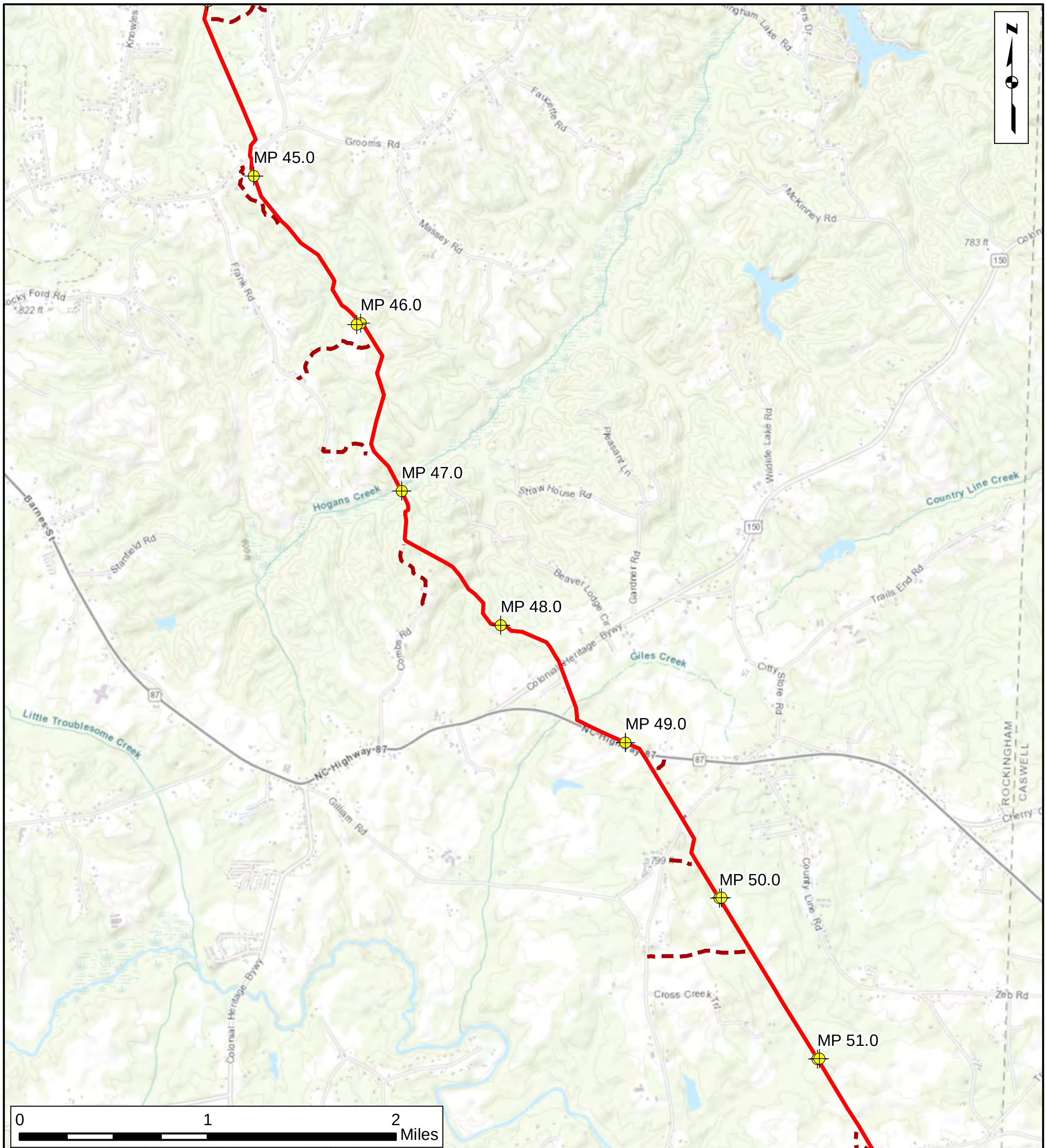

- Milepost
- Proposed Pipeline Route
- Permanent Access Road
- Temporary Access Road
- Mainline Valve
- Yard
- Meter Station/Interconnect
- Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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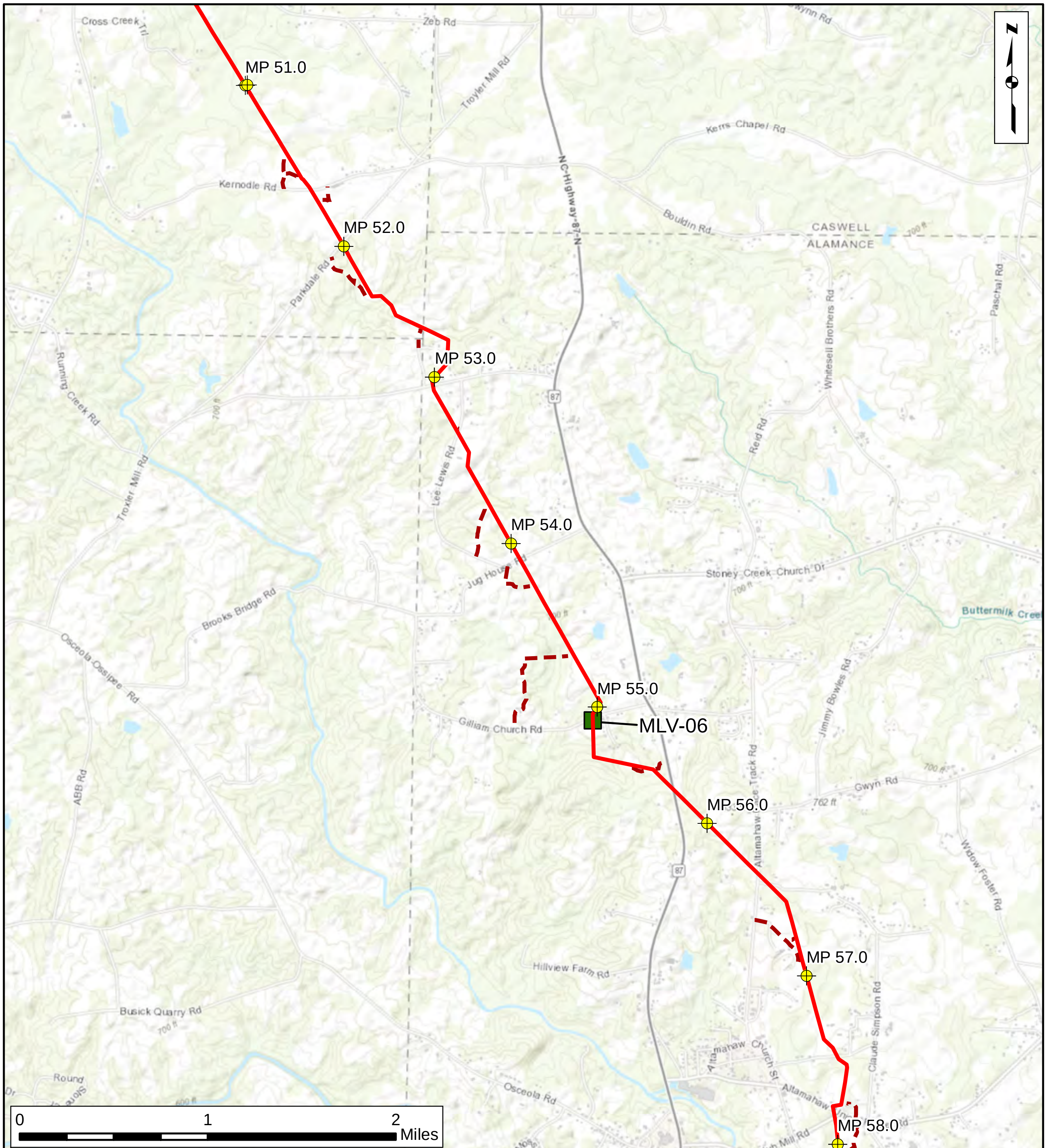

Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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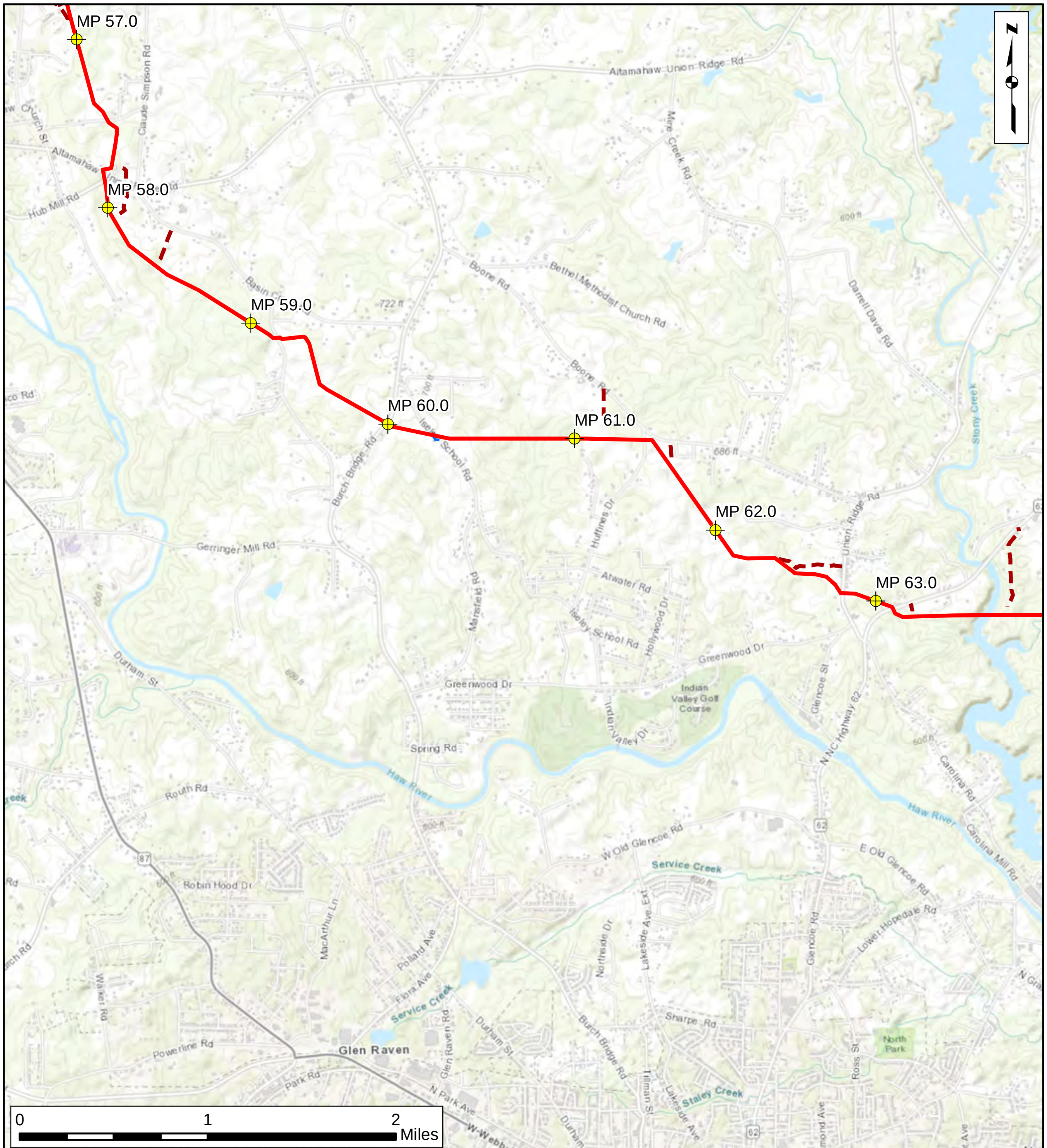

Milepost	Mainline Valve
Proposed Pipeline Route	Yard
Permanent Access Road	Meter Station/Interconnect
Temporary Access Road	Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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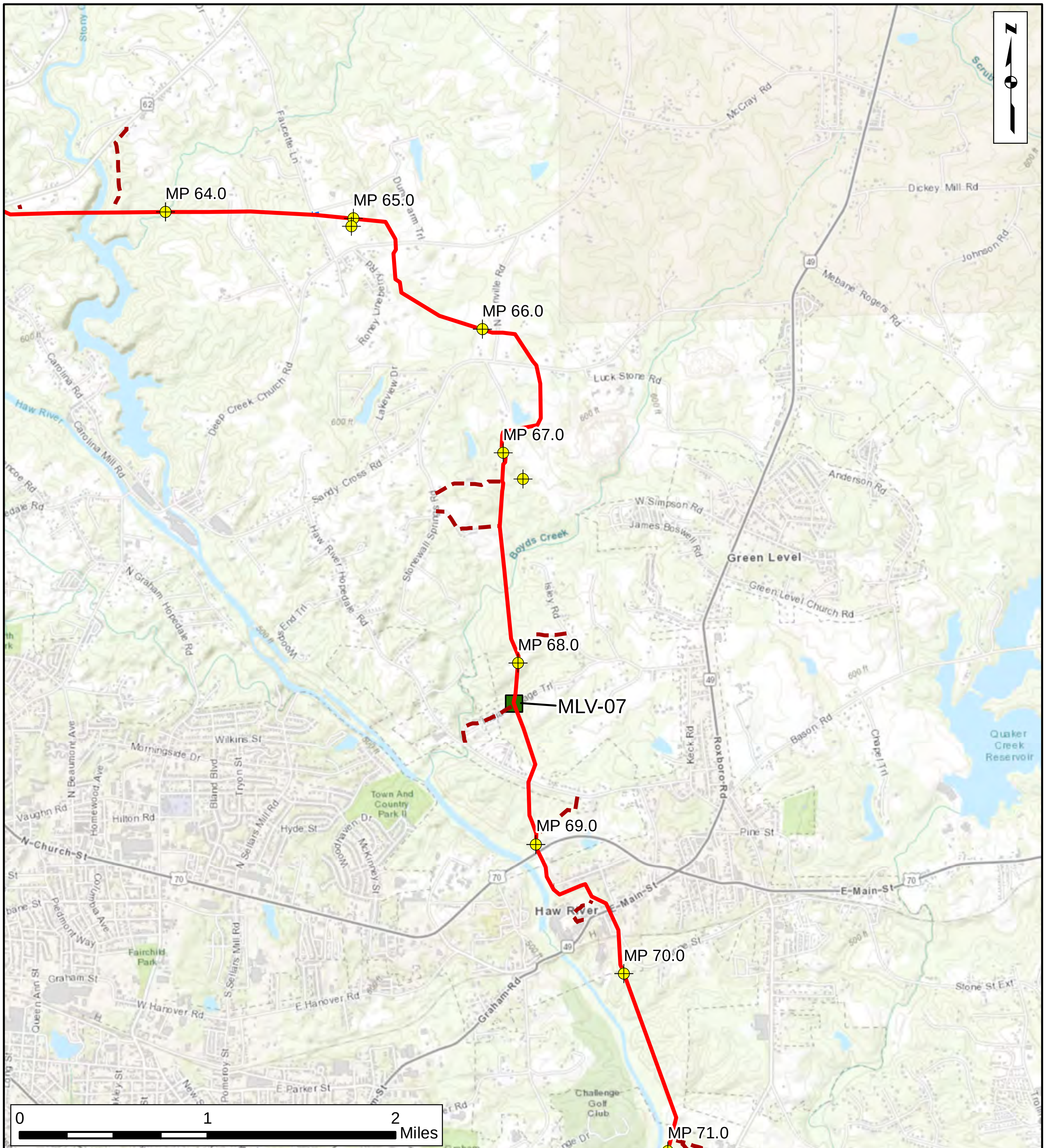

Milepost
Proposed Pipeline Route
Permanent Access Road
Temporary Access Road
Mainline Valve
Yard
Meter Station/Interconnect
Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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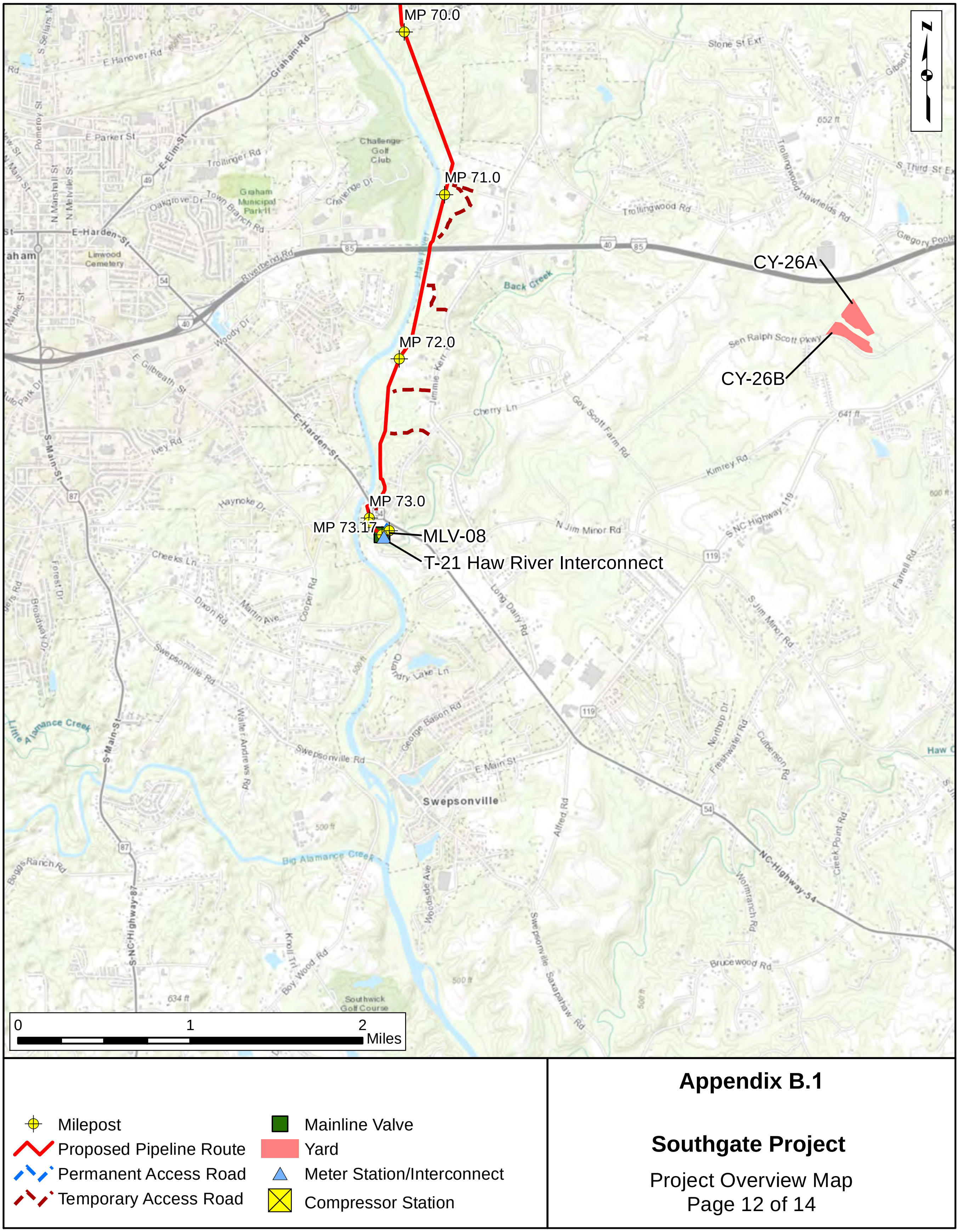

Appendix B.1

Southgate Project

Project Overview Map
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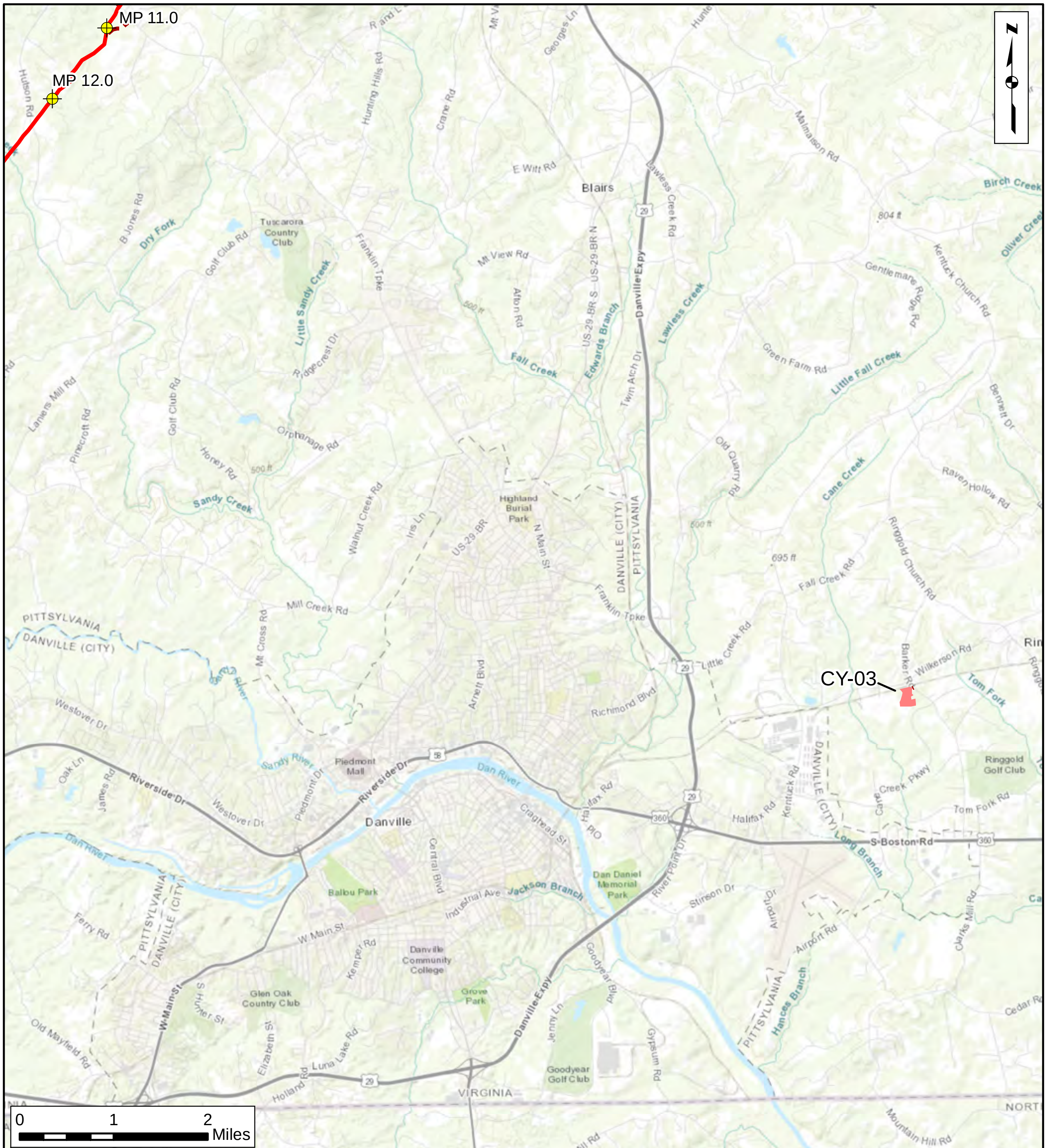

	Milepost		Mainline Valve
	Proposed Pipeline Route		Yard
	Permanent Access Road		Meter Station/Interconnect
	Temporary Access Road		Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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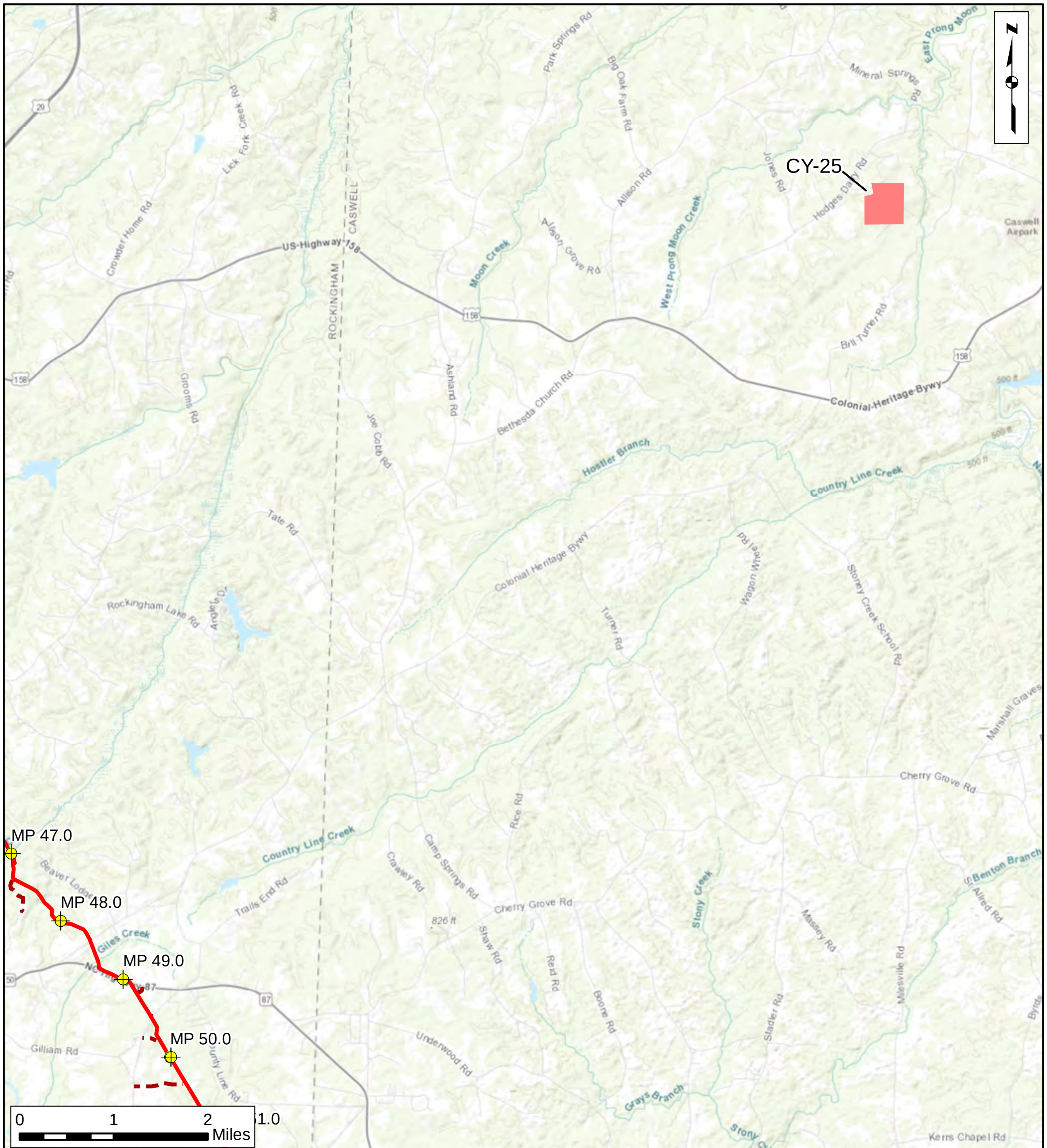

Milepost	Mainline Valve
Proposed Pipeline Route	Yard
Permanent Access Road	Meter Station/Interconnect
Temporary Access Road	Compressor Station

Appendix B.1

Southgate Project

Project Overview Map
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APPENDIX B.2

Typical Right-of-Way Configurations

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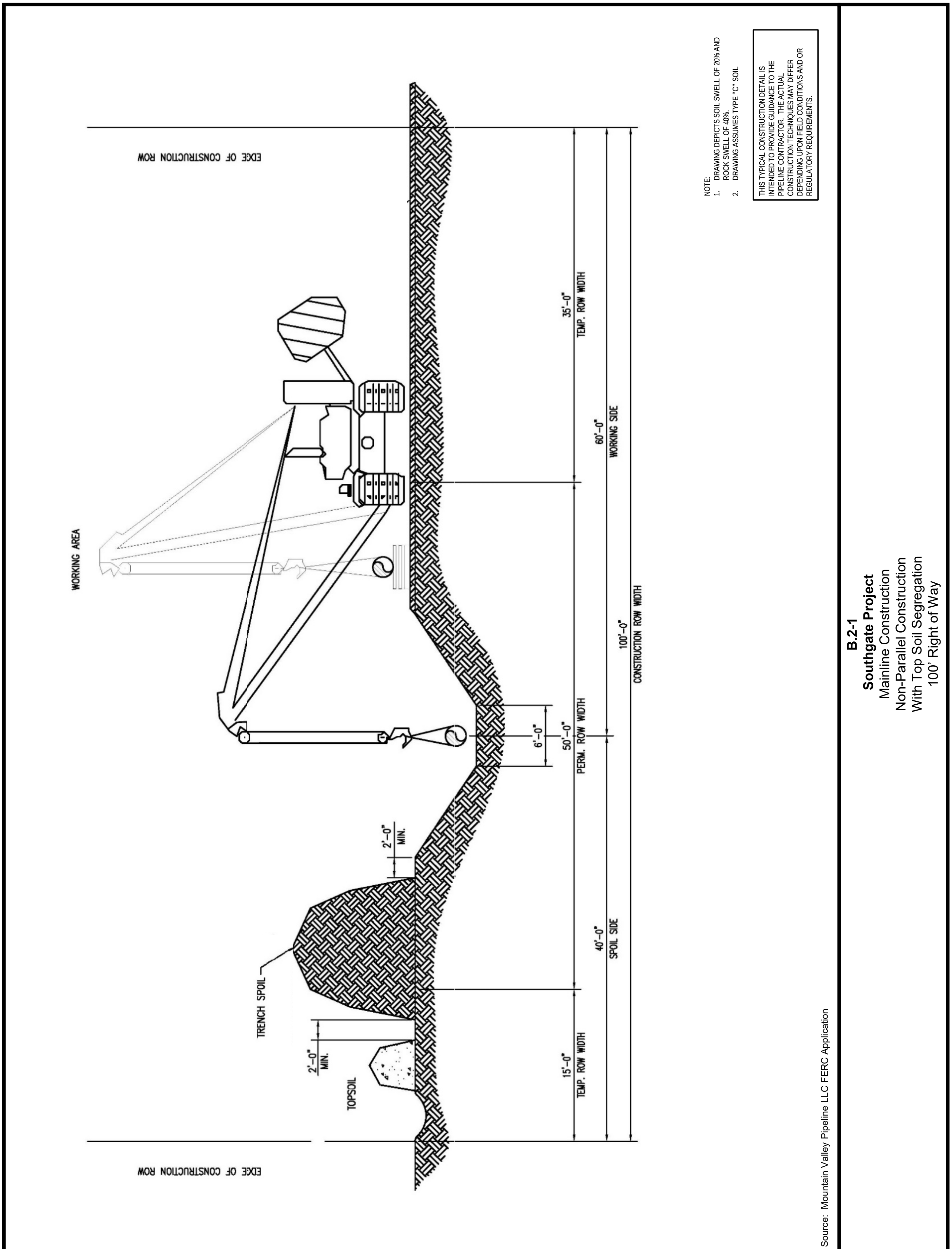
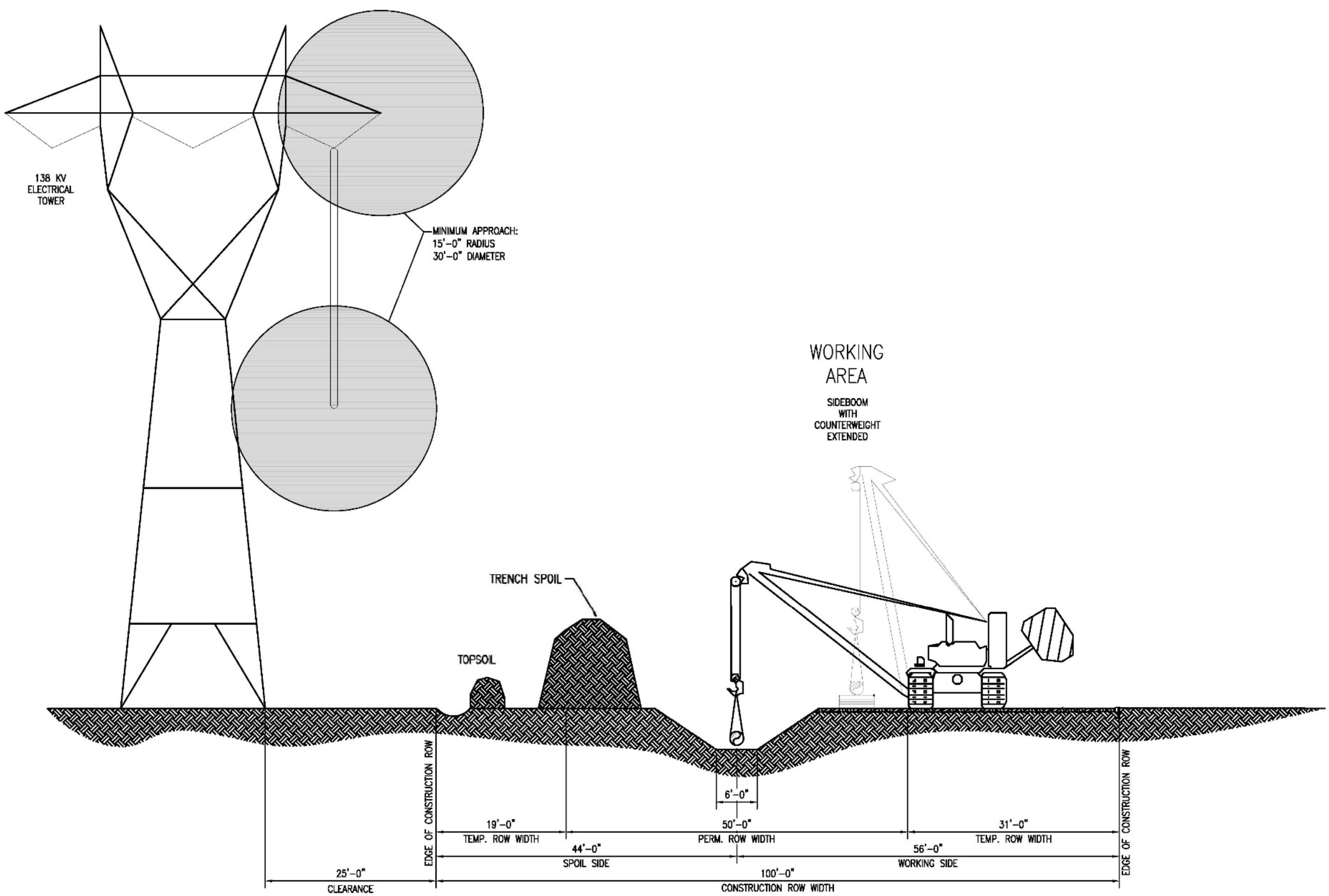

EDGE OF CONSTRUCTION ROW
EDGE OF CONSTRUCTION ROW
WORKING AREA
TRENCH SPOIL
TOPSOIL
2'-0" MIN.
2'-0" MIN.
6'-0"
15'-0" TEMP. ROW WIDTH
40'-0" SPOIL SIDE
50'-0" PERM. ROW WIDTH
60'-0" WORKING SIDE
35'-0" TEMP. ROW WIDTH
100'-0" CONSTRUCTION ROW WIDTH
NOTE:
1. DRAWING DEPICTS SOIL SWELL OF 20% AND ROCK SWELL OF 40%.
2. DRAWING ASSUMES TYPE "C" SOIL
THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.
Source: Mountain Valley Pipeline LLC FERC Application
B.2-1
Southgate Project
Mainline Construction
Non-Parallel Construction
With Top Soil Segregation
100' Right of Way

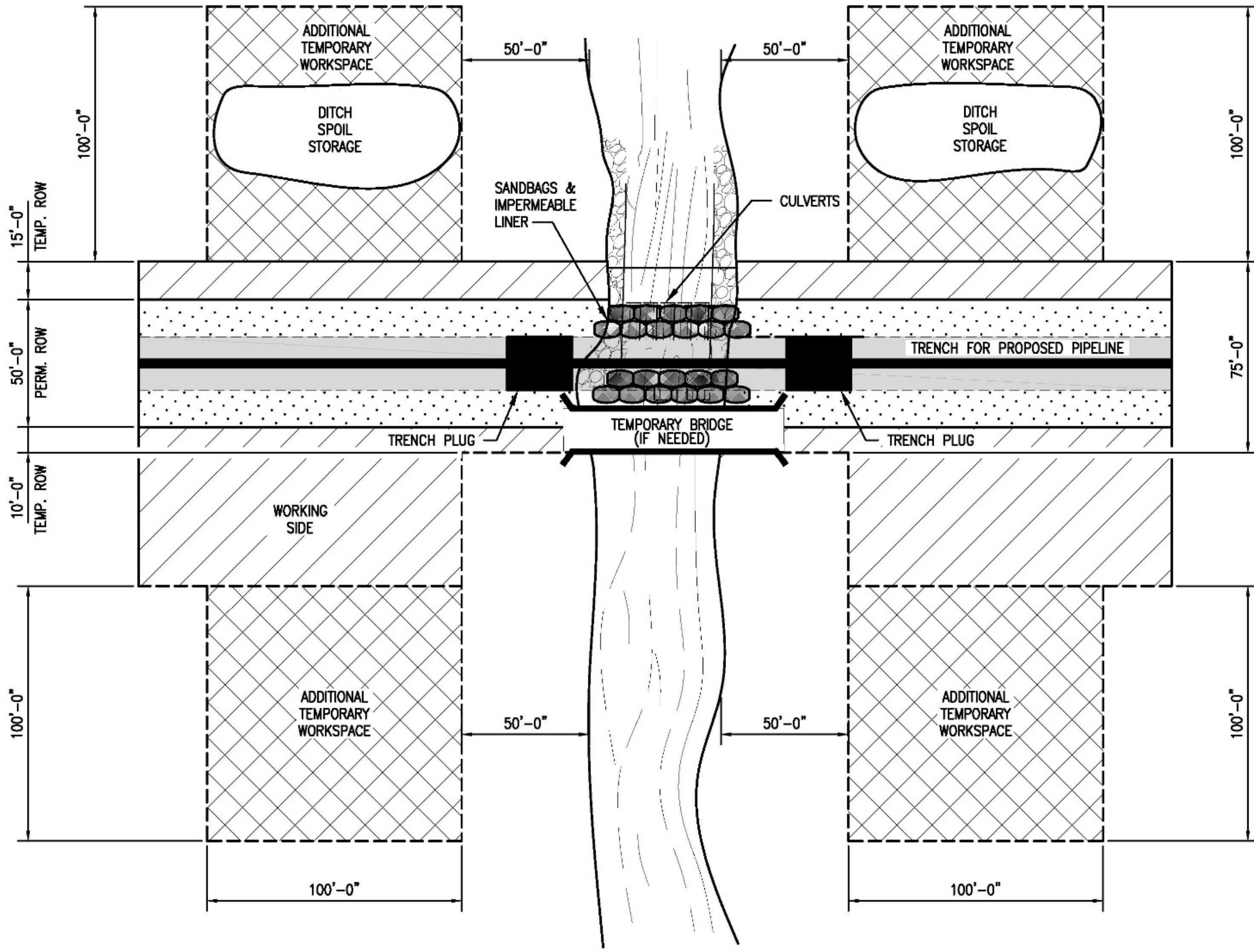


THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

DRAWING ASSUMES TYPE "C" SOIL

Source: Mountain Valley Pipeline LLC FERC Application

B.2-2
Southgate Project
Mainline Construction
Parallel to Power Lines
100' Right-of-Way



THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

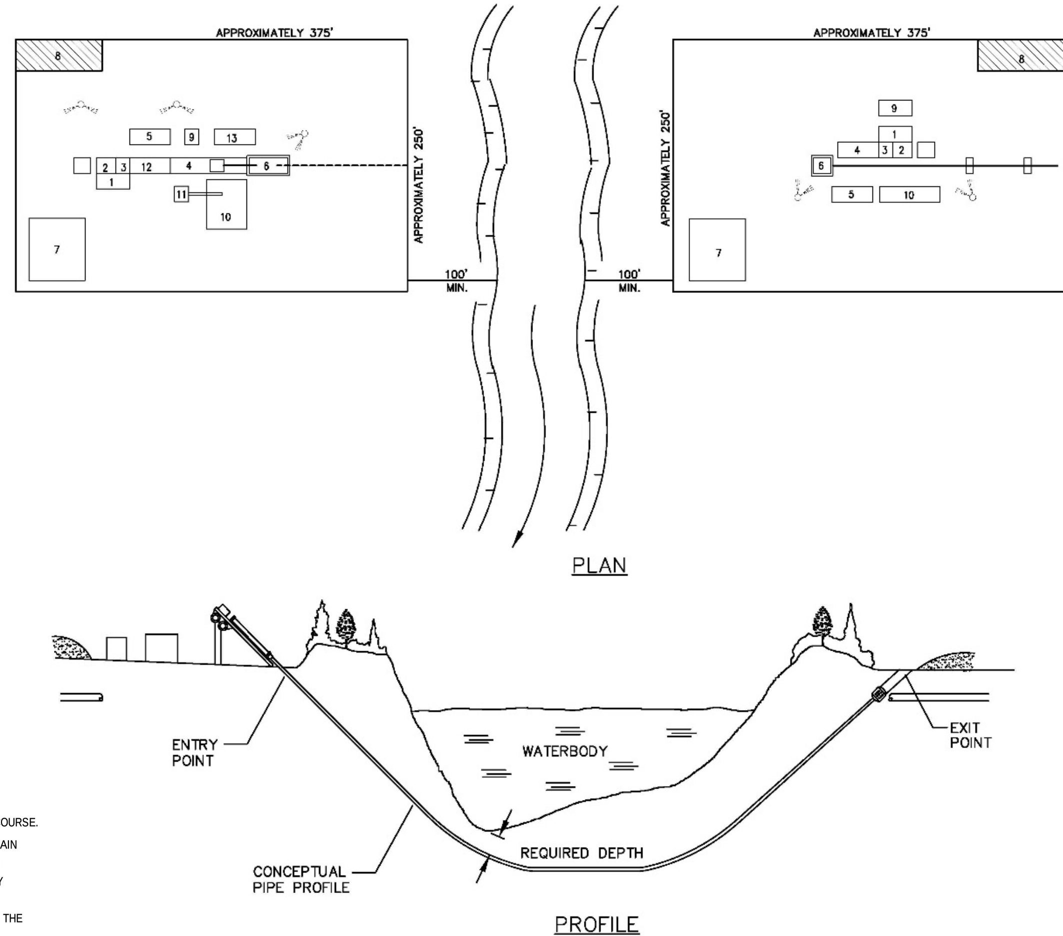
Source: Mountain Valley Pipeline LLC FERC Application

DRAWING ASSUMES TYPE "C" SOIL

B.2-3
Southgate Project
Mainline Construction
Waterbody Crossing
Open Cut – Flume

EQUIPMENT:
1. SPOIL CONTAINER: 8' X 20'
2. SHAKER: 8' X 12'
3. DESILTER: 8' X 8'
4. MUD RIG: 8' X 25'
5. SUPPLY TRAILER: 8' X 25'
6. EXIT PIT: 8' X 10'
7. STORAGE: 30' X 30'
8. VEHICLE PARKING: 15' X 50'
9. DEWATERING UNIT: 8' X 20'
10. PIPE TRAILER: 8' X 40'

HORIZONTAL DIRECTIONAL DRILL METHOD 7



NOTES:
1. SET UP DRILLING EQUIPMENT A MINIMUM OF 100 FEET FROM THE EDGE OF THE WATERCOURSE. DO NOT CLEAR OR GRADE WITHIN THE 100 FOOT ZONE.
2. ENSURE THAT ONLY BENTONITE BASED DRILLING MUD IS USED. DO NOT ALLOW THE USE OF ANY ADDITIVES TO THE DRILLING MUD WITHOUT THE APPROVAL OF COMPANY INSPECTOR.
3. INSTALL SUITABLE DRILLING MUD TANKS OR SUMPS TO PREVENT CONTAMINATION OF WATERCOURSE.
4. INSTALL BERMS DOWNSLOPE FROM THE DRILL ENTRY AND ANTICIPATED EXIT POINTS TO CONTAIN ANY RELEASE OF DRILLING MUD.
5. DISPOSE OF DRILLING MUD IN ACCORDANCE WITH THE APPROPRIATE REGULATORY AUTHORITY REQUIREMENTS.
6. A SEDIMENT BARRIER SHALL BE PLACE ON THE DOWN SLOPE SIDE OF THE RIGHT-OF-WAY, PER THE PROJECT NARRATIVE.

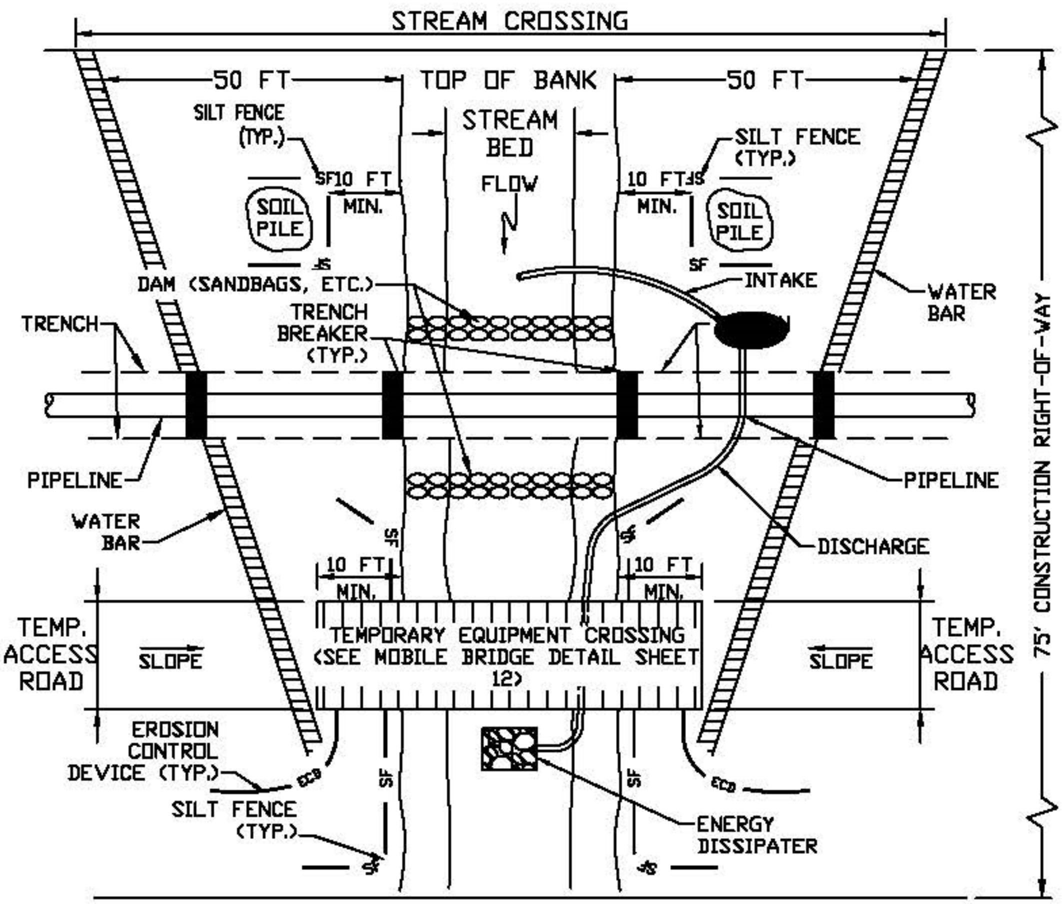
NOTES:
1. EQUIPMENT ORIENTATION MAY VARY DEPENDING ON CONTRACTOR OR SITE CONDITIONS.
2. EQUIPMENT TO BE SUPPORTED ON THE GROUND SURFACE OR TIMBER MATS AS CONDITIONS DICTATE.
3. SILT FENCE, BERMS AND/OR STRAW BALE BARRIER TO BE USED AS REQUIRED TO PREVENT IMPACTS FROM OCCURRING OUTSIDE OF PROJECT LIMITS.
4. HAND CLEARED ACCESS PATH WILL BE USED TO OBTAIN WATER FROM SOURCE WHERE PERMITTED.
5. ENTRANCE & EXIT ANGLES VARY BY LOCATION. REFER TO BORE PROFILE FOR DETAILED INFORMATION.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Source: Mountain Valley Pipeline LLC FERC Application

DRAWING ASSUMES TYPE "C" SOIL

B.2-4
Southgate Project
Mainline Construction
Horizontal Directional Drill
(HDD)



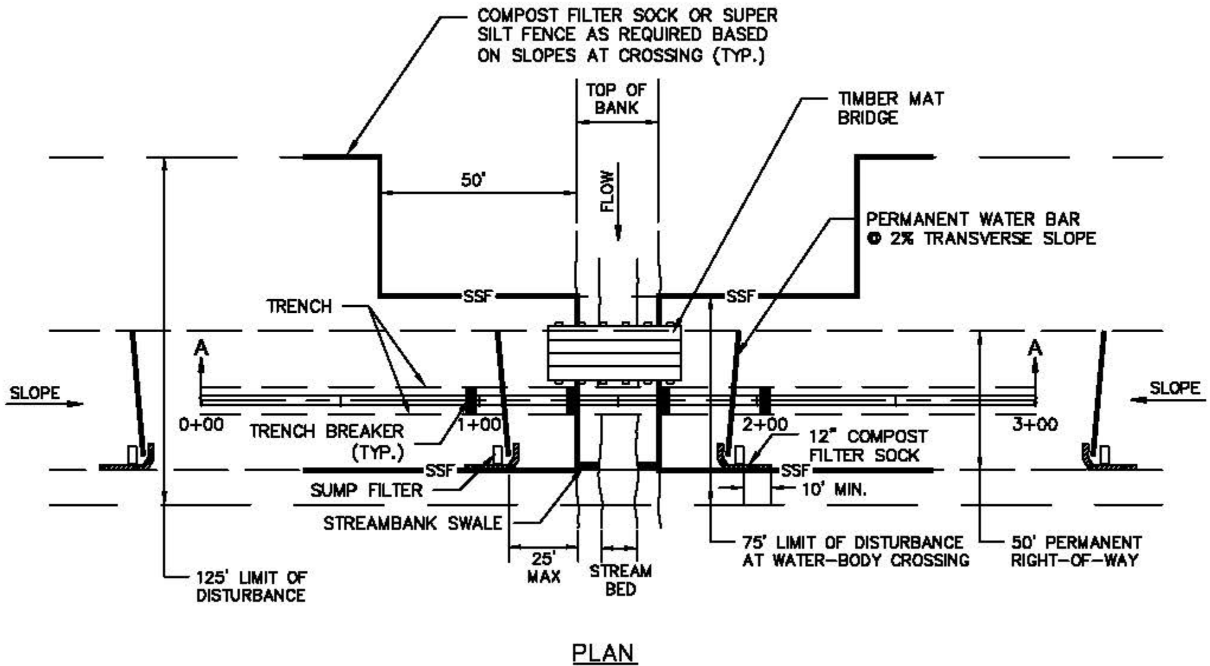
PLAN VIEW

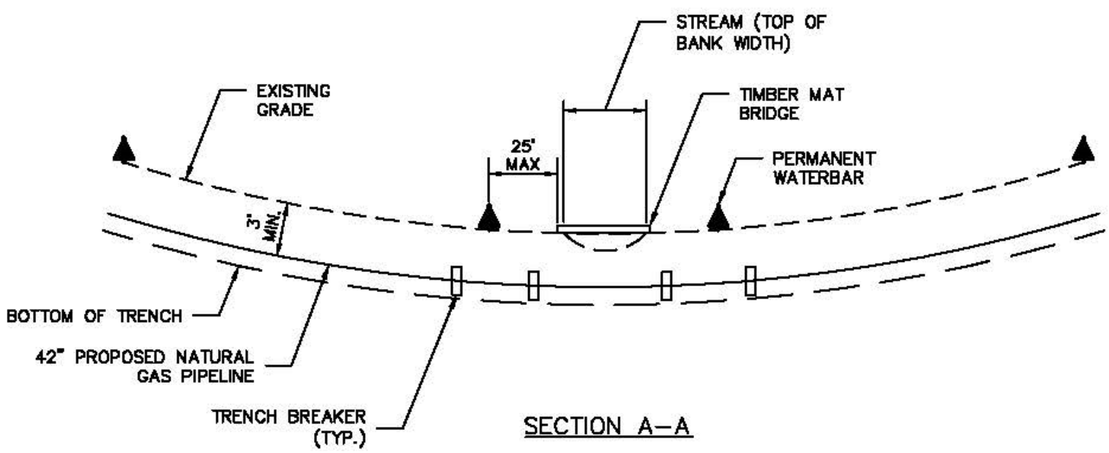
NOTES:

1. INSTALL EROSION CONTROL DEVICES, TRENCH BREAKERS, PUMP, ENERGY DISSIPATER, AND DAMS BEFORE TRENCHING STREAM.
2. PUMP MUST BE OF SUFFICIENT CAPACITY TO CONVEY NORMAL AND/OR EXISTING STREAM FLOW OVER TRENCH. A BACK-UP PUMP OF EQUAL CAPACITY MUST BE AVAILABLE ON-SITE DURING CONSTRUCTION OF THE PIPELINE CROSSING. PUMPS WILL BE PLACED WITHIN SECONDARY CONTAINMENT.
3. PLACE SOIL PILES A MINIMUM OF 10 FEET FROM TOP OF BANK.
4. INSTALL WATER BARS AT APPROACHES TO STREAM CROSSING AND EROSION CONTROL DEVICES, SILT FENCE, OR SUPER SILT FENCE (AS INDICATED ON PLAN SHEETS).
5. MAINTAIN SURFACE OF TEMPORARY EQUIPMENT CROSSING TO PREVENT SOIL DISCHARGES TO STREAM.
6. APPROACHES TO CROSSINGS ARE NOT TO EXCEED A DEPTH OF 6 INCHES ABOVE ORIGINAL GRADE.
7. RESTORE AREA TO ORIGINAL CONTOURS.

Source: Mountain Valley Pipeline LLC FERC Application

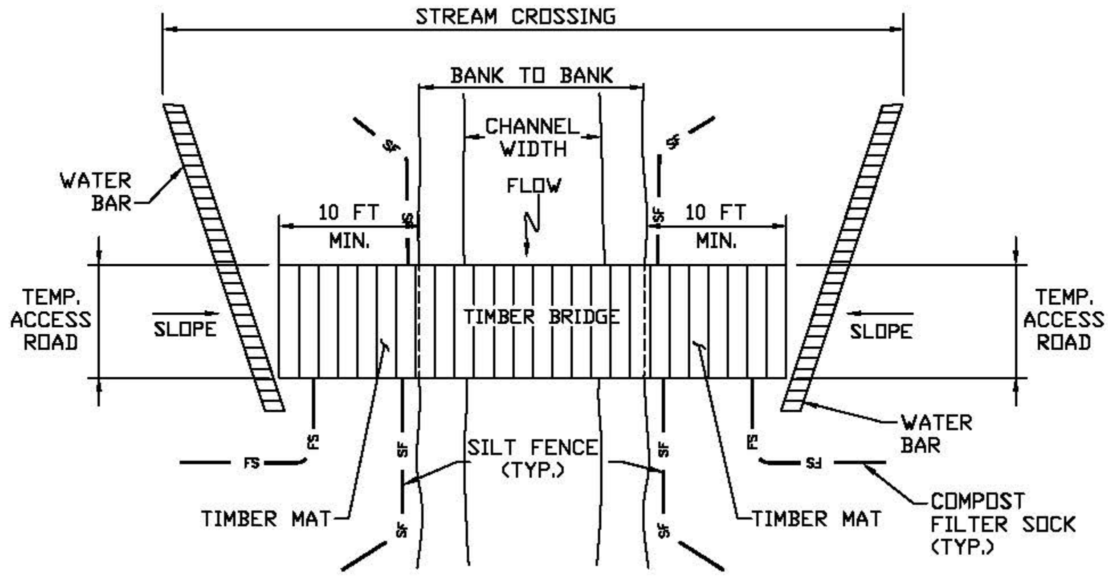
B.2-5
Southgate Project
Stream Crossing
Dam and Pump



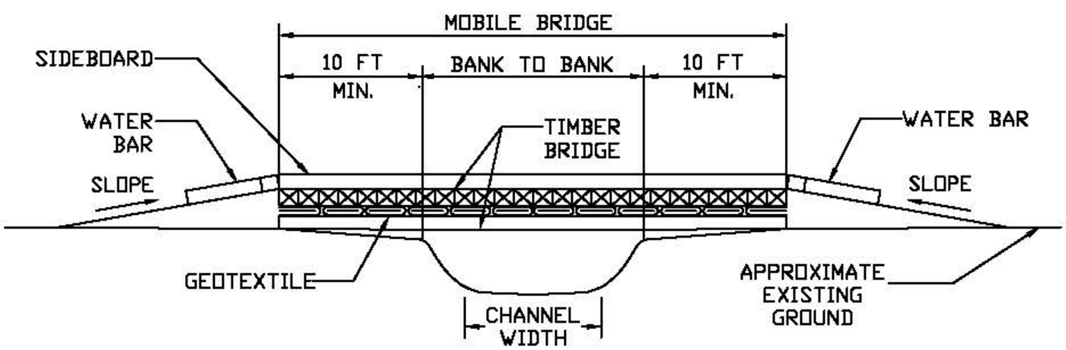


Source: Mountain Valley Pipeline LLC FERC Application

B.2-6
Southgate Project
Timber Mat Bridge
Stream Crossing



PLAN VIEW



CROSS SECTION - MOBILE BRIDGE

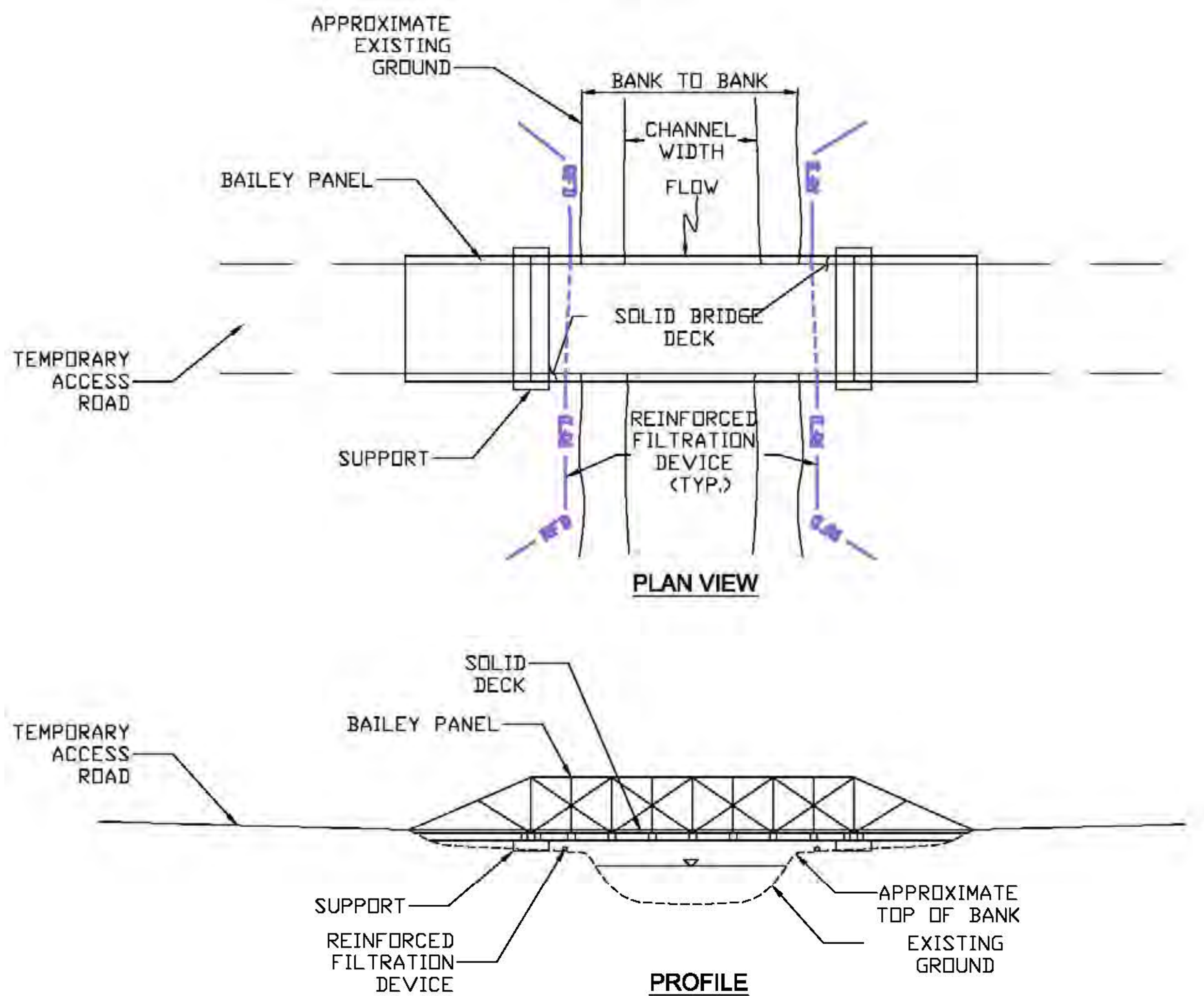
NOTES:

1. INSTALL WATER BARS OR SILT FENCE AT APPROACHES TO STREAM CROSSING AND COMPOST FILTER SOCKS ALONG STREAM BANKS. INSTALL COMPOST FILTER SOCK AT OUTLET OF WATER BARS.
2. MAINTAIN SURFACE OF TEMPORARY EQUIPMENT CROSSING TO PREVENT SOIL DISCHARGES TO STREAM.
3. APPROACHES TO CROSSINGS ARE NOT TO EXCEED A DEPTH OF 6 INCHES ABOVE ORIGINAL GRADE.
4. GEOTEXTILE LINER TO COME UP ON THE SIDES OF THE BRIDGE A MINIMUM OF 18".
5. SIDEBOARDS TO BE ATTACHED TO THE UPPER DECK. GEOTEXTILE TO BE WRAPPED AROUND SIDEBOARDS PRIOR TO FASTENING.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-7
Southgate Project
Mobile Bridge



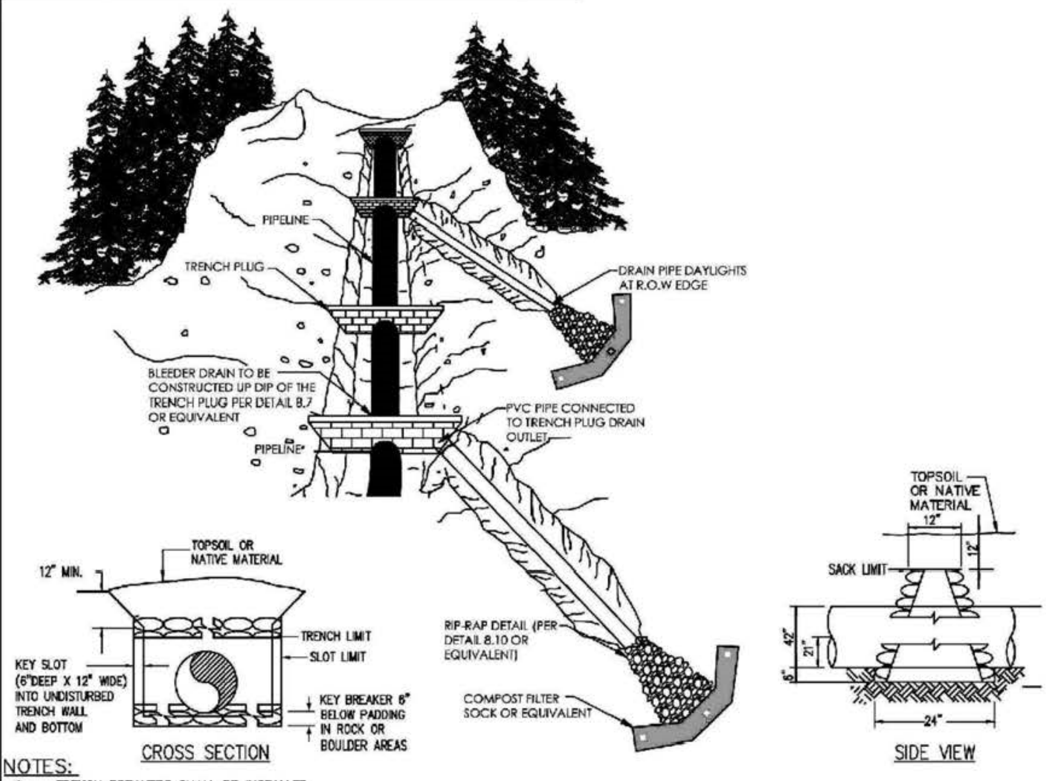
THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-8
Southgate Project
Modular Temporary
Bailey Bridge

SLOPE %	DISTANCE	PLUG MATERIAL
0% – 5%	SEE NOTE 6	CONCRETE FILLED SACKS
5% – 15%	500 FT	SANDBAGS OR CONCRETE FILLED SACKS
15% – 25%	300 FT	SANDBAGS OR CONCRETE FILLED SACKS
25% – 35%	200 FT	SANDBAGS OR CONCRETE FILLED SACKS
35% – 100%	100 FT	SANDBAGS OR CONCRETE FILLED SACKS
> 100%	50 FT	CONCRETE FILLED BAGS (WETTED)

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.



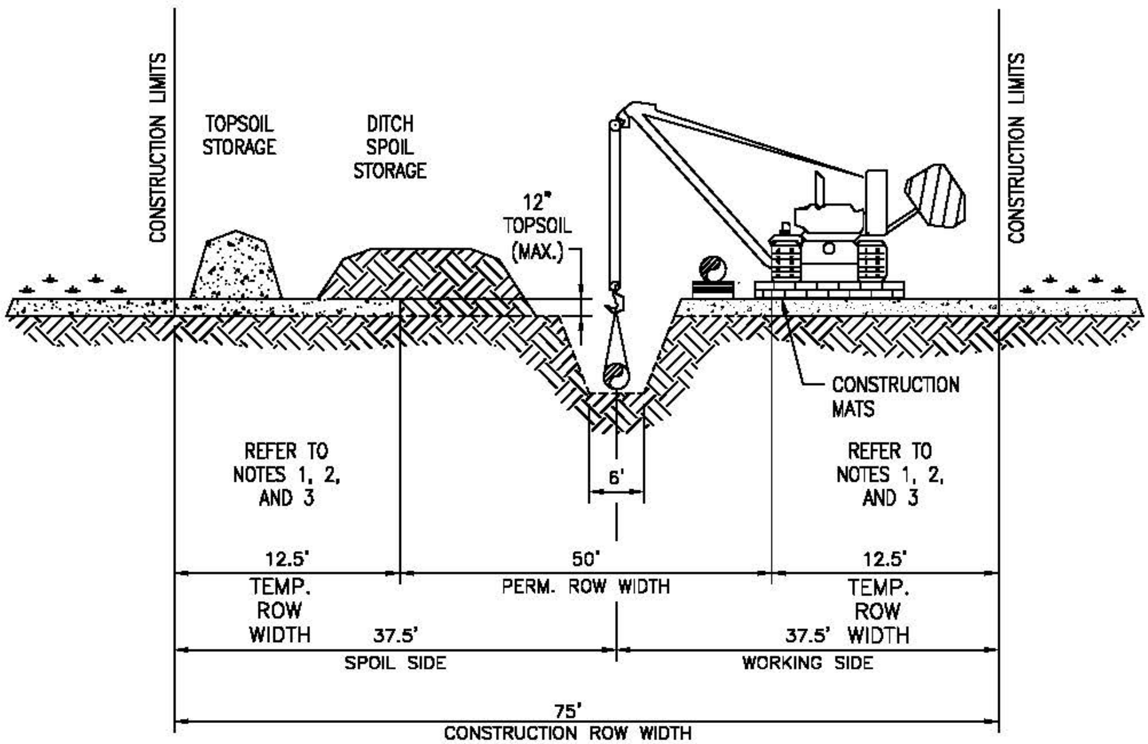
NOTES:

1. TRENCH BREAKERS SHALL BE INSTALLED:
   - ON SLOPES ALONG THE TRENCH LINE WHERE THE NATURAL DRAINAGE PATTERN, PROFILE, AND TYPE OF BACKFILL MATERIAL MAY RESULT IN LOSS OF BACKFILL MATERIAL OR ALTERATION OF THE NATURAL PATTERN;
   - AT THE BASE OF SLOPES ADJACENT TO WATERBODIES AND WETLANDS;
   - WHERE NEEDED TO AVOID DRAINING A WETLAND;
   - ON UPLAND SLOPES, AT THE SAME SPACING AS SLOPE BREAKERS AND UP SLOPE OF SLOPE BREAKERS;
   - IN CULTIVATED LAND AND RESIDENTIAL AREAS WHERE PERMANENT SLOPE BREAKERS ARE NOT TYPICALLY INSTALLED, AT THE SAME SPACING AS IF PERMANENT SLOPE BREAKERS WHERE REQUIRED.
2. MATERIALS APPROPRIATE FOR USE AS PERMANENT TRENCH BREAKERS INCLUDE SANDBAGS OR CONCRETE FILLED SACKS. TOPSOIL SHALL NOT BE USED FOR TRENCH BREAKERS.
3. TRENCH BREAKERS INSTALLED AT WATERBODY AND WETLAND CROSSINGS SHALL BE CONSTRUCTED OF IMPERVIOUS MATERIALS (CONCRETE FILLED SACKS).
4. BREAKER SPACING AND CONFIGURATION MAY BE CHANGED AS DIRECTED BY MVP. DEPTH OF DITCH MAY VARY WITH SITE CONDITIONS.
5. ALL MATERIALS SHALL BE SUPPLIED BY CONTRACTOR.
6. TRENCH BREAKERS ARE REQUIRED AT ALL WATERBODY CROSSINGS REGARDLESS OF TRENCH SLOPE. OTHERWISE NOTE REQUIRED AT SLOPES < 5%.
7. SINGLE TRENCH BREAKERS WILL BE A MINIMUM WIDTH OF 24" AND DOUBLE TRENCH BREAKERS WILL BE A MINIMUM WIDTH OF 36".
8. FOR SUBSURFACE AND TRENCH BREAKER DRAINAGE DETAILS INCLUDING THOSE FOR STEEP SLOPES, SEE LANDSLIDE MITIGATION TYPICAL DETAILS.
9. FOR SLOPES EXCEEDING 50%, CONCRETE FILLED SACKS ARE REQUIRED UNLESS OTHERWISE APPROVED BY MVP.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-9
Southgate Project
Typical Trench Breaker Requirements



NOTES:

1. TOPSOIL SEGREGATION/REMOVAL WILL ONLY BE CONDUCTED WITHIN THE PERMANENT EASEMENT AT ALL WETLAND CROSSINGS IN VIRGINIA.

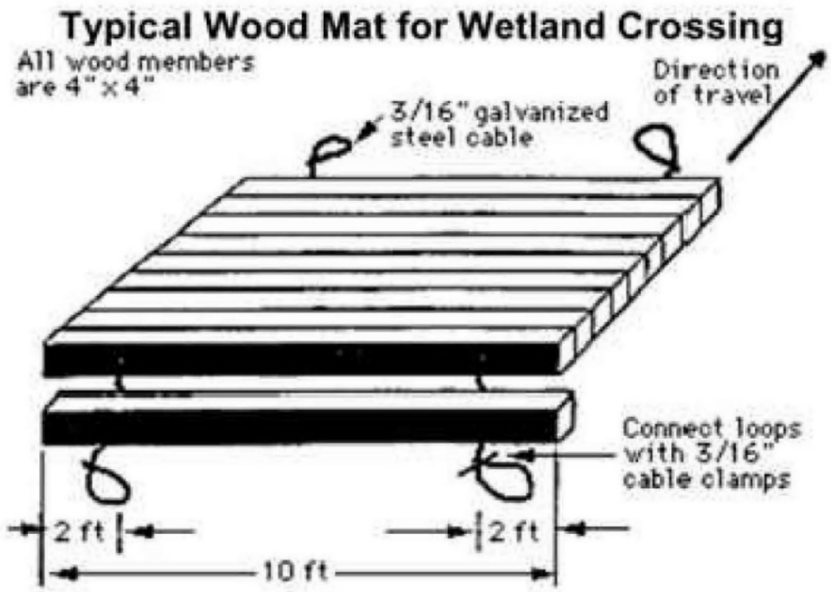
2. GRUBBING ACTIVITIES SHALL BE LIMITED TO THE PERMANENT EASEMENT AT ALL WETLAND CROSSINGS IN VIRGINIA. OUTSIDE OF THE PERMANENT EASEMENT, WETLAND VEGETATION SHALL ONLY BE REMOVED AT OR ABOVE THE GROUND SURFACE. WOODY VEGETATION WITHIN THE TEMPORARY EASEMENT SHALL BE CUT AT GROUND SURFACE WITH THE STUMPS TO REMAIN IN-PLACE.

3. WETLAND CROSSINGS IN VIRGINIA SHALL BE CONDUCTED IN ACCORDANCE WITH NWP12 GENERAL AND NORFOLK DISTRICT REGIONAL CONDITIONS.

THIS TYPICAL CONSTRUCTION DETAIL IS INTENDED TO PROVIDE GUIDANCE TO THE PIPELINE CONTRACTOR. THE ACTUAL CONSTRUCTION TECHNIQUES MAY DIFFER DEPENDING UPON FIELD CONDITIONS AND OR REGULATORY REQUIREMENTS.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-10
Southgate Project
Wetland Crossing Typical for
USACE Norfolk (VA) District



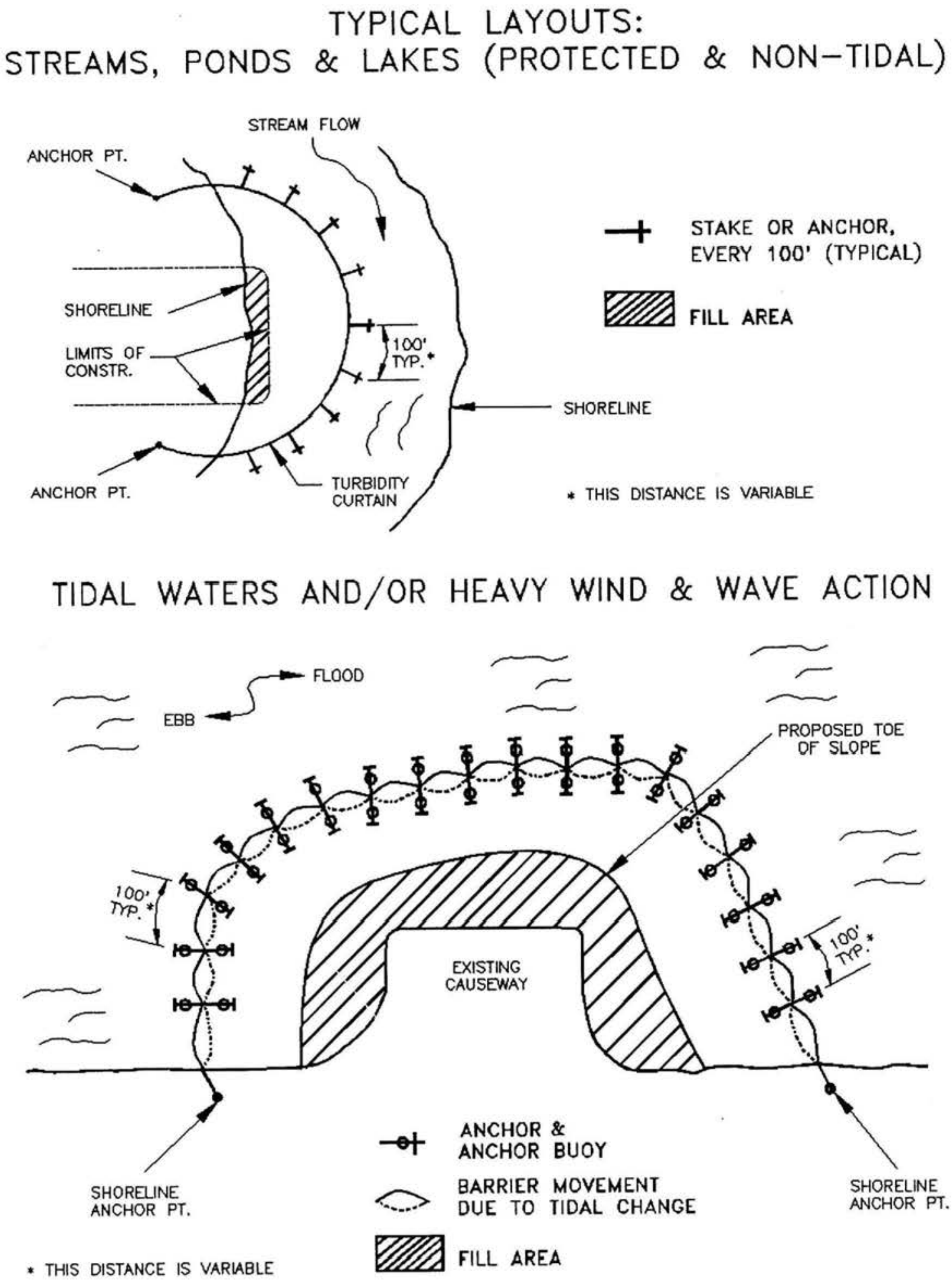
University of Minnesota FS 07009

A geotextile underlayment shall be used under the wood mat.

Source: PaDEP, E&S Pollution Control Manual, March 2012

Source: Mountain Valley Pipeline LLC FERC Application

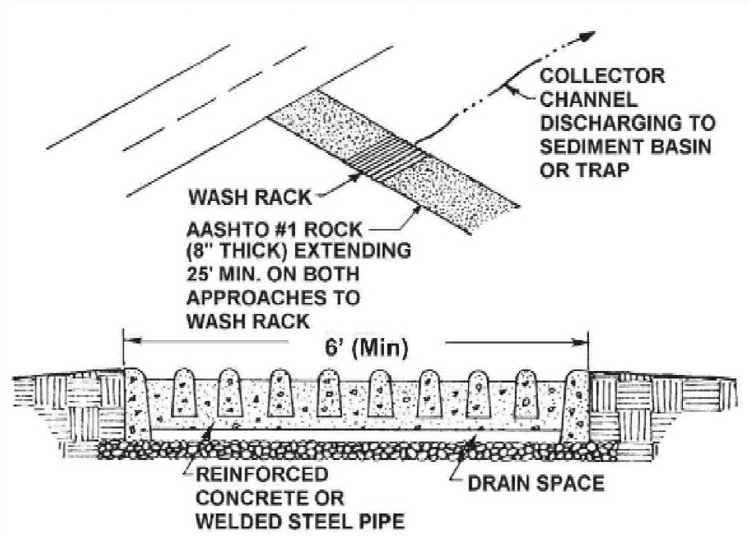
B.2-11
Southgate Project
Timber Mat / Wetland Crossing



Source: Mountain Valley Pipeline LLC FERC Application

B.2-12
Southgate Project
Turbidity Curtain Detail

Rock Construction Entrance with Wash Rack



Modified from Smith Cattleguard Company

IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 70 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK.

Wash rack shall be 20 feet (min.) wide or total width of access.

Wash rack shall be designed and constructed to accommodate anticipated construction vehicular traffic.

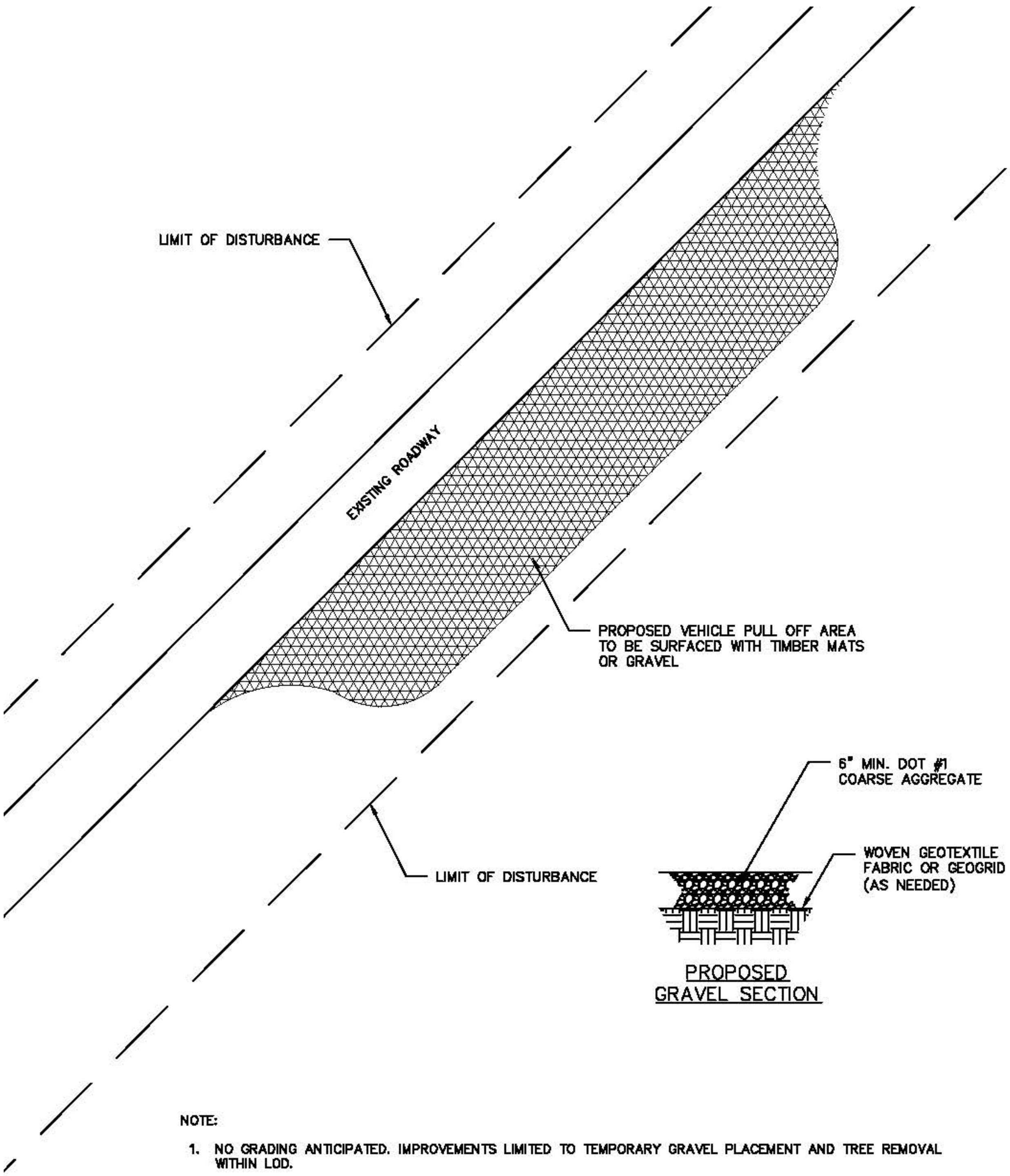
A water supply shall be made available to wash the wheels of all vehicles exiting the site.

MAINTENANCE: Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. A stockpile of rock material shall be maintained on site for this purpose. Drain space under wash rack shall be kept open at all times. Damage to the wash rack shall be repaired prior to further use of the rack. All sediment deposited on roadways shall be removed and returned to the construction site immediately. Washing the roadway or sweeping the deposits into roadway ditches, sewers, culverts, or other drainage courses is not acceptable.

A metal wash rack or livestock grate is an acceptable alternative to the reinforced concrete one shown in the standard detail. Approaches to the wash rack should be lined with aashto #1 at a minimum of 25' on both sides. The wash rack should discharge to a sediment removal facility, such as a vegetated filter strip or into a channel leading to a sediment removal device (e.g. a sediment trap or sediment basin). Rock construction entrances with wash racks should be maintained to the specified dimensions by adding rock when necessary at the end of each workday. A stockpile of rock material should be maintained on site for this purpose. Sediment deposited on paved roadways should be removed and returned to the construction site.
NOTE: Washing the roadway or sweeping the deposits into roadway ditches, sewers, culverts, or other drainage courses is not acceptable. Damaged wash racks should be repaired as necessary to maintain their effectiveness. In lieu of washrack installation, MVP will extend the RCE by 70' Increments until mud tracking condition Is alleviated.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-13
Southgate Project
Rock Construction Entrance
With Wash Rack



NOTE:

1. NO GRADING ANTICIPATED. IMPROVEMENTS LIMITED TO TEMPORARY GRAVEL PLACEMENT AND TREE REMOVAL WITHIN LOD.
2. WOVEN GEOTEXTILE FABRIC OR GEOGRID MAY BE PLACED UNDER THE GRAVEL PULL OFF AS NEEDED.

Source: Mountain Valley Pipeline LLC FERC Application

B.2-14
Southgate Project
Temporary Vehicle
Pull Off Detail

APPENDIX B.3

Additional Temporary Workspaces –
Within 50 Feet of a Waterbody or Wetland

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Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
Virginia, Pittsylvania County							
1001C	0.5	Waterbody	AS-APP-6001	12	ATWS situated in this location to provide support of Lambert construction.	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1020	1.3	Wetland	W-F18-5	38	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1030	4.0	Waterbody	S-F18-67	43	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.	N	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1052	5.2	Wetland	W-D18-1	0	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1088B	9.8	Wetland	W-F18-58	47	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland crossing and point of intersect.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1113	13.4	Wetland	W-E18-28	19	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
1136C	17.7	Wetland/ Waterbody	S-A19-295/ S-E18-44/ W-A19-296	1 49 0	ATWS situated in this location for storage of material, pumps, mats, pipe for wetland and stream crossing.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation
1169	22.0	Wetland	W-A18-204	32	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1178	23.0	Wetland	W-A19-318	24	ATWS situated in this location to support staging and storage of materials and timber mats for foreign pipeline crossing, multiple stream /wetland crossings with ROW width restrictions.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
North Carolina, Rockingham County							
1213	27.0	Wetland	W-A18-44	0	This ATWS is in an agriculture field and will be used for pipeline crossing.	N	The request for ATWS within 50 feet of the wetland appears justified in order to cross Transco facilities. Potential impacts would be minimized by the proposed mitigation.
1213A	27.0	Wetland	W-A18-44	6	This ATWS is in an agriculture field and will be used for pipeline crossing.	N	The request for ATWS within 50 feet of the wetland appears justified in order to cross Transco facilities. Potential impacts would be minimized by the proposed mitigation.
1213D	27.3	Wetland	W-A18-44	0	ATWS in this location to be used for support during stream crossing.	Y	The request for ATWS within 50 feet of the wetland appears justified in order to cross Transco facilities. Potential impacts would be minimized by the proposed mitigation.

Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
1222	27.6	Wetland	W-A19-274	0	ATWS in this location to be used for support during stream crossing.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1224A	28.0	Wetland	W-A18-26/ W-A19-39	48	This ATWS is in an agriculture field and will be used for pipeline crossing.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1244/1244A	29.9	Wetland	W-A18-18	0	ATWS situated in this location to support HDD and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
			S-B18-38	0	ATWS situated in this location to support HDD and associated equipment	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1249	30.4	Wetland/ Waterbody	W-B18-34	35	ATWS situated in this location to support HDD and associated equipment	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
			AW-B18-36 / W-B18-36	0	ATWS situated in this location to support HDD and associated equipment// hydrostatic testing equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1250	30.5	Wetland	W-B18-34	0	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1251/1251A	30.4/30.3	Wetland	W-B19-36/ W-B18-34	0	ATWS situated in this location to support HDD and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
1253D	30.9	Waterbody	S-B19-153	49	ATWS in this location to be used for support during stream crossing.	N	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1368	41.5	Waterbody	S-B18-44	15	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1369	41.6	Waterbody	AS-B18-44	44	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1426A	46.7	Waterbody	S-A19-291	38	ATWS for vehicle passage along access road.	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1426B	46.7	Waterbody	S-A19-291	9	ATWS for vehicle passage along access road.	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1446A	48.5	Wetland	W-B18-139	29	ATWS in agricultural field to support wetland crossing and associated equipment.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
North Carolina, Alamance County							
1511	55.5	Wetland	W-B18-61	23	This ATWS is inside an agriculture field and will be used to support crews at PI.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
1588G	65.3	Wetland/ Waterbody	S-A19-324/ W-A19-323	37/0	ATWS for staging / storage of material, pumps, mats, pipe, boring equipment for road crossing.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1588K	65.5	Wetland	W-B19-168	0	This ATWS is inside an agriculture field and will be used to support crews at PI.	N	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
1588Y1	67.1	Waterbody	AS-APP-1568	17	ATWS for staging / storage of material, pumps, mats, pipe, boring equipment for road crossing.	N	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1653B	69.7	Waterbody	S-B19-147	34	This ATWS to be used as support for crews working in the congested area	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1653C	69.8	Waterbody	S-B19-147	38	This ATWS to be used as support for crews working in the congested area	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1653D	69.8	Wetland/ Waterbody	AS-B19-174 S-B19-174 W-B19-173	17 0 0	ATWS situated in this location for staging / storage of material, pumps, mats, pipe, boring equipment to support railroad crossing and stream crossing.	Y	The request for ATWS within 50 feet of the wetland/waterbody appears justified and potential impacts would be minimized by the proposed mitigation.
1692A	73.0	Wetland	W-A18-111	0	ATWS situated in this location to support conventional bore and associated equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

Appendix B.3

ATWS Within 50 feet of Wetland or Waterbody

ATWS ID	Milepost	Feature within 50 feet	Feature ID	Distance from Resource Area (feet) a/	Justification	Variance Required (Y/N)	FERC Comment
			AS-B19-149	40	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area	Y	The request for ATWS within 50 feet of the waterbody appears justified and potential impacts would be minimized by the proposed mitigation
1692	73.1	Wetland/ Waterbody	W-A18-111	0	ATWS situated in this location to support conventional bore and associated equipment / hydrostatic test support equipment.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.
			W-B19-151	0	This ATWS to be used as a support for crews performing multiple pipeline crossings in this area.	Y	The request for ATWS within 50 feet of the wetland appears justified and potential impacts would be minimized by the proposed mitigation.

a/ Distance from resource area of 0 feet indicate the wetland or waterbody is located within the ATWS.

APPENDIX B.4

Access Roads

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Appendix B.4

Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
Virginia												
TAR	TA-PI-000	0.0	Existing	Temporary	Mountain Valley Pipeline, LLC	25	334	Gr	FW, OL	G, S	0.19	0.00
TAR	TA-PI-000A	0.0	Existing	Temporary	Mountain Valley Pipeline, LLC	25	12	G	CI, OL	S, W	0.02	0.00
TAR	TA-PI-000B	CY-03	Existing	Temporary	Private	25	62	A	CI	None	0.10	0.00
PAR	PA-PI-001A	0.0	Existing	Permanent	Transcontinental Gas Pipeline Company, LLC Private Mountain Valley Pipeline, LLC	25	3,028	A, G, D	AG, CI, FW, OL	S, W	1.46	1.46
PAR	PA-PI-001B	0.0	New	Permanent	Transcontinental Gas Pipeline Company, LLC Private Mountain Valley Pipeline, LLC	25	827	Gr	AG, FW, OL	S, W	0.49	0.49
PAR	PA-PI-001C	0.0	Existing	Permanent	Private	25	713	D	OL	S, W	0.34	0.34
TAR	TA-PI-003	1.2	Existing	Temporary	Private	25	2,369	G, Gr	CI, OL, RD	S, W	1.38	0.00
TAR	TA-PI-004	1.6	Existing	Temporary	Private	25	2,874	D	CI, FW, OL, RD	S, W	1.71	0.00
TAR	TA-PI-005	2.3	Existing	Temporary	Private	25	3,736	G, D, Gr	CI, FW, OL, OW, RD, WL	S, C, W	2.17	0.00
TAR	TA-PI-006	3.4	Existing	Temporary	Private	25	1,285	G, D, Gr	AG, CI, OL	S, C, W	0.75	0.00
TAR	TA-PI-006A	3.7RR	Existing	Temporary	Private	25	3,498	D	AG, CI, FW, OL	S, W	2.01	0.00
TAR	TA-PI-007	4.6	Existing	Temporary	Private	25	896	G, D, Gr	OL, RD	S, W	0.53	0.00
TAR	TA-PI-008	4.5	Existing	Temporary	Private	25	304	G	CI, RD	S, W	0.17	0.00
TAR	TA-PI-009	4.8	Existing	Temporary	Private	25	3,961	G	CI, FW, OL	S, W	2.28	0.00
TAR	TA-PI-011	5.1	Existing	Temporary	Private	25	5,364	D	AG, CI, FW, OL, RD, WL	S, W	3.09	0.00
TAR	TA-PI-015	5.6	Existing	Temporary	Pittsylvania County, VA	25	1,076	G	FW, OL	S, W	0.62	0.00
TAR	TA-PI-016	5.9	Existing	Temporary	Pittsylvania County, VA	25	3,461	G, Gr	CI, FW, OL	S, W	1.99	0.00
TAR	TA-PI-017	6.2	Existing	Temporary	Pittsylvania County, VA	25	823	G	CI, OL	S, W	0.51	0.00
TAR	TA-PI-018	6.8	Existing	Temporary	Private	25	1,530	D	FW, OL	S, W	0.89	0.00
PAR	PA-PI-018A	7.2	New	Permanent	Private	25	18	Gr	CI, OL	S, W	0.00	0.00
PAR	PA-PI-018B	7.4	New	Permanent	Private	25	50	Gr	CI	S, W	0.03	0.03
TAR	TA-PI-021	8.2	Existing	Temporary	Private	25	414	D	CI, FW, OL	S, W	0.25	0.00
TAR	TA-PI-022	8.5	Existing	Temporary	Private	25	2,071	D	FW, OL, RD	S, W	1.19	0.00
TAR	TA-PI-023	8.9	Existing	Temporary	Private	25	2,121	G	AG, CI, FW, OL, RD	S, W	1.23	0.00
TAR	TA-PI-024	9.1	Existing	Temporary	Private	25	1,396	G, D, Gr	AG, FW, OL	S, W	0.81	0.00
TAR	TA-PI-025	9.6	Existing	Temporary	Private	25	2,226	D, Gr	AG, CI, FW, OL	S, W	1.37	0.00
TAR	TA-PI-026B	10.3	New	Temporary	Private	25	31	D, Gr	CI, OL	S, W	0.03	0.00
PAR	PA-PI-026C	10.7	New	Permanent	Independent Timber, Inc.	25	30	Gr	OL	S, W	0.01	0.01

Appendix B.4

Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-PI-027	11.1	Existing	Temporary	Independent Timber, Inc.	25	1,590	G, D	FW, OL	S, W	0.92	0.00
PAR	PA-PI-029	12.4	Existing	Permanent	Private	25	214	G	AG, CI, OL	S	0.13	0.13
TAR	TA-PI-032	13.0	Existing	Temporary	Private	25	1,052	G	OL	S, W	0.60	0.00
TAR	TA-PI-033	13.2	Existing	Temporary	Private	25	735	G	FW, OL	S, W	0.43	0.00
TAR	TA-PI-034	13.7	Existing	Temporary	Private	25	2,643	G, D, Gr	CI, FW, OL, OW	S, W	1.53	0.00
TAR	TA-PI-035	14.1	Existing	Temporary	Private	25	4,378	D, Gr	AG, FW, OL, OW, RD	S, W	2.52	0.00
TAR	TA-PI-036	14.9	Existing	Temporary	Private	25	199	G	AG	S, W	0.11	0.00
TAR	TA-PI-037	15.2	Existing	Temporary	Private	25	1,809	G	AG, CI, OL	S, W	1.05	0.00
TAR	TA-PI-038	15.8	Existing	Temporary	Private	25	1,053	G, Gr	FW, OL, OW, RD	S, W	0.65	0.00
TAR	TA-PI-039	16	Existing	Temporary	Private	25	573	G	AG, CI, FW, OL, RD	S, W	0.34	0.00
TAR	TA-PI-041	16.7	Existing	Temporary	Private	25	639	G	FW, OL, RD	S, W	0.38	0.00
TAR	TA-PI-042	16.7	Existing	Temporary	Private	25	2,509	G, D	AG, CI, FW, OL	S, W	1.45	0.00
TAR	TA-PI-043	17.2	Existing	Temporary	Private	25	2,123	D	AG, CI, FW, OL, OW, RD	S, W	1.23	0.00
TAR	TA-PI-046	18.0	Existing	Temporary	Private	25	1,543	G, D, Gr	AG, CI, FW, OL	S, W	0.89	0.00
PAR	PA-PI-046A	18.3	New	Permanent	Private	25	24	Gr	AG, CI	S, W	0.02	0.02
TAR	TA-PI-048	18.7	Existing	Temporary	Private	25	1,289	G, D, Gr	AG, CI, FW, OL, RD	S, W	0.74	0.00
TAR	TA-PI-049	19.5	Existing	Temporary	Private	25	273	G	OL, RD	S, W	0.17	0.00
TAR	TA-PI-050	19.9	Existing	Temporary	Private	25	307	A	CI, OL	None	0.19	0.00
TAR	TA-PI-051A	20.2	Existing	Temporary	Private	25	94	D	CI, RD	S, W	0.05	0.00
TAR	TA-PI-052	20.4	Existing	Temporary	Private	25	2,871	D	AG, CI, FW, OL	S, W, C	1.66	0.00
PAR	PA-PI-053	21.1	Existing	Permanent	Private	25	744	G, Gr	OL, RD	S, W	0.43	0.43
TAR	TA-PI-055	21.6	Existing	Temporary	Private	25	2,938	G, D, Gr	AG, CI, FW, OL, RD	S, W	1.71	0.00
TAR	TA-PI-061	23.0	Existing	Temporary	Danville-Pittsylvania Regional Industrial Facility Authority	25	4,103	G, D, Gr	FW, OL, OW, WL	S, W, C	2.36	0.00
TAR	TA-PI-063	24.0	Existing	Temporary	Danville-Pittsylvania Regional Industrial Facility Authority	25	2,750	G, D, Gr	CI, FW, OL, OW	S, W, C	1.59	0.00
TAR	TA-PI-064	24.6	Existing	Temporary	Danville-Pittsylvania Regional Industrial Facility Authority	25	2,669	G, D, Gr	CI, FW, OL	S, W	1.54	0.00
TAR	TA-PI-066	24.8	Existing	Temporary	Private	25	2,345	G, D, Gr	CI, FW, OL	S, W	1.38	0.00

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Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-PI-067	25.1	Existing	Temporary	Private	25	1,917	G, D, Gr	FW, OL, OW, WL	S, W	1.19	0.00
TAR	TA-PI-068	26.0	Existing	Temporary	Private	25	1,202	D	FW, OL	S, W	0.23	0.00
										Virginia Subtotal:	*51.08*	*2.91*
North Carolina												
TAR	TA-PI-068	26.0	Existing	Temporary	Private	25	731	D	FW, WL	S, W	0.48	0.00
TAR	TA-RO-070	26.2	Existing	Temporary	Private	25	513	G, D, Gr	FW, OL	S, W	0.30	0.00
TAR	TA-RO-071	26.7	Existing	Temporary	Private	25	3,340	G, D	CI, FW, OL, RD	S, W	2.00	0.00
TAR	TA-RO-072	26.9	Existing	Temporary	Private	25	1,040	G	CI, FW, OL, RD	S, W	0.61	0.00
TAR	TA-RO-072A	27.0	New	Temporary	Private	25	226	Gr	AG, OL, RD	S, W	0.14	0.00
TAR	TA-RO-073	27.1	Existing	Temporary	Private	25	1,349	G, D, Gr	AG, CI, FW, OL, WL	S, W	0.80	0.00
TAR	TA-RO-073A	27.4	Existing	Temporary	Private	25	2,772	G, D, Gr	AG, CI, OL, OW, WL	S, W	1.67	0.00
TAR	TA-RO-075	27.8	Existing	Temporary	Private	25	2,206	G, D, Gr	AG, OL, WL	S, W	1.27	0.00
PAR	PA-RO-000	28.2	Existing	Permanent	Private	25	4,956	G, Gr	CI, FW, OL, WL	S, W	2.86	2.86
TAR	TA-RO-000A	CY-08	Existing	Temporary	Private	25	344	A	CI, OL	None	0.21	0.00
TAR	TA-RO-076	28.6	Existing	Temporary	Private	25	2,477	G, D	FW, OL	S, W	1.43	0.00
TAR	TA-RO-078	29.2	Existing	Temporary	Private	25	2,209	C, G, D	CI, FW, OL, RD	S, W	1.29	0.00
TAR	TA-RO-079	29.6	Existing	Temporary	Private	25	288	G, D, Gr	AG, OL	S, W	0.17	0.00
TAR	TA-RO-079A	29.6	Existing	Temporary	Private	25	1,832	G, D, Gr	OL, RD	S, W	1.06	0.00
TAR	TA-RO-080	29.9	Existing	Temporary	Private	25	3,587	G, D, Gr	AG, CI, OL, RD	S, W	2.08	0.00
TAR	TA-RO-081	30.4	New	Temporary	Private	25	17	G	OL	S, W	0.02	0.00
PAR	PA-RO-082	30.4	Existing	Permanent	Public Service Company of North Carolina, Inc.	25	161	G	CI, OL, WL	S, W	0.12	0.12
PAR	PA-RO-082A	30.4	Existing	Permanent	Public Service Company of North Carolina, Inc.	25	115	G	CI, OL	S,W	0.06	0.06
TAR	TA-RO-082A	CY-04	Existing	Temporary	Private	25	413	Gr	CI, OL	S, W	0.25	0.00
TAR	TA-RO-082C	CY-05	Existing	Temporary	Private	25	8	C	CI	None	0.02	0.00
TAR	TA-RO-082D	CY-05	Existing	Temporary	Private	25	6	A	CI	None	0.01	0.00
TAR	TA-RO-082E	CY-05	Existing	Temporary	Private	25	7	A	CI	None	0.01	0.00
TAR	TA-RO-084	31.7	New	Temporary	Private	25	93	Gr	CI, OL	S, W	0.06	0.00
TAR	TA-RO-085	32.4	Existing	Temporary	Private	25	3,670	G, D	CI, FW, OL, RD	S, W	2.12	0.00
TAR	TA-RO-086	32.5	Existing	Temporary	Private	25	370	D	OL	S, W	0.29	0.00
TAR	TA-RO-087	32.8	Existing	Temporary	Private	25	2,654	G, D, Gr	FW, OL, RD	S, W	1.54	0.00

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Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-RO-088	33.6	Existing	Temporary	Private	25	1,752	G, D, Gr	CI, FW, OL, RD	S, W	1.03	0.00
TAR	TA-RO-089	34.1	Existing	Temporary	Private	25	1,812	G, Gr	CI, FW, OL, RD	S, W	1.05	0.00
TAR	TA-RO-091	34.7	Existing	Temporary	Private	25	1,001	D	FW, OL	S, W	0.58	0.00
TAR	TA-RO-092	35.4	Existing	Temporary	Private	25	867	G, D	FW, OL, RD	S, W	0.51	0.00
TAR	TA-RO-093	35.7	Existing	Temporary	Private	25	732	D	AG, CI, FW, OL	S, W	0.42	0.00
TAR	TA-RO-094	35.9	Existing	Temporary	Private	25	778	D	AG, FW, OL	S, W	0.46	0.00
TAR	TA-RO-095	36.2	Existing	Temporary	Private	25	611	G, D	AG, FW, OL	S, W	0.36	0.00
TAR	TA-RO-099	36.7	Existing	Temporary	Private	25	744	D	AG, CI, FW, RD	S, W	0.44	0.00
TAR	TA-RO-100	37.1	Existing	Temporary	Private	25	1,936	D	FW, OL	S, W	1.12	0.00
TAR	TA-RO-102	37.6	Existing	Temporary	Private	25	1,532	A, G, D, Gr	OL, RD	S, W	0.89	0.00
TAR	TA-RO-103	38.1	Existing	Temporary	Private	25	1,440	G, D	FW, OL, RD	S, W	0.87	0.00
TAR	TA-RO-104	38.6	Existing	Temporary	Private	25	352	D	CI, FW, OL	S, W	0.21	0.00
TAR	TA-RO-106	38.9	Existing	Temporary	City Of Reidsville	25	426	G	FW, OL	S, W	0.25	0.00
TAR	TA-RO-107	39.4	Existing	Temporary	Private	25	1,950	D	AG, CI, FW, OL, RD	S, W	1.13	0.00
TAR	TA-RO-108	39.6	New	Temporary	Private	25	195	Gr	FW, OL	S, W	0.12	0.00
PAR	PA-RO-109	39.7	Existing	Permanent	Private Duke Power Company	25	1,153	G	CI, OL	S, W	0.67	0.67
TAR	TA-RO-111	40.9	Existing	Temporary	Private	25	4,482	G, D, Gr	AG, CI, FW, OL, RD	S, W	2.58	0.00
TAR	TA-RO-112	41.4	Existing	Temporary	Private	25	3,433	G, D	CI, FW, OL	S, W	1.97	0.00
TAR	TA-RO-113	41.8	Existing	Temporary	Private	25	162	D, Gr	FW, OL	S, W	0.11	0.00
PAR	PA-RO-113A	41.8	Existing	Permanent	Private	25	1,982	D, Gr	FW, OL, WL	S, W	1.09	1.09
PAR	PA-RO-114A	42.2	New	Permanent	Private	25	83	Gr	CI, FW, OL	S, W	0.05	0.05
TAR	TA-RO-115	42.4	Existing	Temporary	Private	25	585	G	CI, FW, OL, RD	S, W	0.34	0.00
TAR	TA-RO-115A	43.2	New	Temporary	Private Duke Power Company	25	87	G, Gr	CI, FW, OL	S, W	0.06	0.00
TAR	TA-RO-117	43.4	New	Temporary	Private	25	44	Gr	CI, OL	S, W	0.03	0.00
TAR	TA-RO-118	43.4	New	Temporary	Private	25	148	Gr	CI, OL	S, W	0.09	0.00
TAR	TA-RO-119	43.9	Existing	Temporary	Private	25	1,889	G, D	CI, FW, OL, RD	S, W	1.11	0.00
TAR	TA-RO-122	44.1	Existing	Temporary	Private	25	1,845	G, D	CI, FW, OL, RD	S, W	1.09	0.00
TAR	TA-RO-124	44.8	Existing	Temporary	Private	25	252	D	AG, CI, FW, OL	S, W	0.15	0.00
PAR	PA-RO-124A	44.9	New	Permanent	Private	25	27	Gr	AG, CI	S, W	0.01	0.01
TAR	TA-RO-125	45.0	New	Temporary	Private	25	227	Gr	AG, FW	S, W	0.14	0.00
TAR	TA-RO-126	45.3	Existing	Temporary	Private	25	2,268	D	AG, FW, OL, RD	S, W	1.31	0.00
TAR	TA-RO-127	46.1	Existing	Temporary	Private	25	2,143	G, D	AG, FW, OL, RD	S, W	1.23	0.00

Appendix B.4

Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Road Dimensions Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-RO-129	46.8	Existing	Temporary	Private	25	1,636	G, D	AG, CI, FW, OL	S, W	0.96	0.00
TAR	TA-RO-130	47.3	Existing	Temporary	Private	25	2,200	G, D	CI, FW, OL, RD	S, W	1.27	0.00
TAR	TA-RO-131	48.2	Existing	Temporary	Private	25	1,859	G, D, Gr	AG, OL	S, W	1.08	0.00
TAR	TA-RO-133	48.6	Existing	Temporary	Duke Power Company Private	25	1,207	D, Gr	AG, CI, FW, OL	S, W	0.72	0.00
TAR	TA-RO-134	48.9	Existing	Temporary	Private	25	26	G	CI	S, W	0.03	0.00
TAR	TA-RO-135	49.2	Existing	Temporary	Private	25	446	D	CI, OL	S, W	0.27	0.00
TAR	TA-RO-136	49.5	New	Temporary	Private	25	134	Gr	OL	S, W	0.09	0.00
TAR	TA-RO-138	49.8	Existing	Temporary	Private	25	858	D, Gr	FW, OL	S, W	0.49	0.00
TAR	TA-RO-139	50.3	Existing	Temporary	Private	25	2,833	D	AG, FW, OL	S, W	1.53	0.00
TAR	TA-RO-140	51.4	Existing	Temporary	Private	25	913	D	AG, FW, OL	S, W	0.53	0.00
TAR	TA-RO-141	51.6	Existing	Temporary	Private	25	471	D	AG, OL	S, W	0.28	0.00
TAR	TA-RO-142	51.7	Existing	Temporary	Private	25	657	D	AG, CI, OL	S, W	0.39	0.00
TAR	TA-RO-144	52.2	Existing	Temporary	Private	25	1,204	D	AG, FW, OL	S, W	0.71	0.00
TAR	TA-RO-145	52.3	Existing	Temporary	Private	25	600	D	FW, OL	S, W	0.36	0.00
TAR	TA-RO-146A	52.6	Existing	Temporary	Private	25	549	G	CI, OL	S, W	0.31	0.00
TAR	TA-GU-000	CY-09	Existing	Temporary	Private	25	23	G, D	OL	S, W	0.19	0.00
TAR	TA-AL-147	53.0	Existing	Temporary	Private	25	116	D	CI, FW, OL, RD	S, W	0.08	0.00
TAR	TA-AL-149	53.3	New	Temporary	Private	25	20	Gr	CI, OL	S, W	0.02	0.00
TAR	TA-AL-152	53.5	Existing	Temporary	Private	25	483	G	OL, RD, SC	S, W	0.29	0.00
TAR	TA-AL-153	53.8	Existing	Temporary	Private	25	1,411	D	AG, OL	S, W	0.82	0.00
TAR	TA-AL-154	54.3	Existing	Temporary	Private	25	2,294	D	AG, FW	S, W	1.34	0.00
TAR	TA-AL-155	54.7	Existing	Temporary	Private	25	3,351	D	AG, FW, OL, OW	S, W	1.95	0.00
PAR	PA-AL-155A	55.1	New	Permanent	Private	25	40	Gr	AG, OL	S, W	0.03	0.03
TAR	TA-AL-156	55.5	Existing	Temporary	Private	25	599	D	AG, FW, OL	S, W	0.34	0.00
TAR	TA-AL-157	55.6	Existing	Temporary	Private	25	427	D	FW, OL	S, W	0.25	0.00
TAR	TA-AL-159	56.3	Existing	Temporary	Private	25	224	G	CI, FW, OL	S, W	0.14	0.00
TAR	TA-AL-159B	56.8	Existing	Temporary	Private	25	212	G, D, Gr	CI, OL	S, W	0.13	0.00
TAR	TA-AL-159A	56.9	Existing	Temporary	Private	25	1,816	A, G, Gr	CI, OL	S, W	1.06	0.00
TAR	TA-AL-161	57.7	New	Temporary	Private	25	651	G, Gr	FW, OL, RD	S, W	0.37	0.00
TAR	TA-AL-162	58.1	Existing	Temporary	Private	25	1,020	Gr, D	AG, FW, OL	S, W	0.59	0.00
TAR	TA-AL-163	58.4	Existing	Temporary	Private	25	1,044	OL, G	CI, OL	S, W	0.60	0.00
PAR	PA-AL-164	58.8	Existing	Permanent	Private	25	1,068	D	CI, FW, OL	S, W	0.61	0.61
TAR	TA-AL-165	60	New	Temporary	Private	25	151	Gr	CI, OL	S, W	0.10	0.00
PAR	PA-AL-166	60.3	Existing	Permanent	Private	25	144	Gr	CI, OL	S, W	0.09	0.09

Appendix B.4

Proposed New, Improved, and Private Access Roads for the Southgate Project

State/ Facility/ Road ID a/	Road Name	Milepost b/	New or Existing	Proposed for Temporary or Permanent Use	Ownership / Management	Road Dimensions Width (feet)	Length (feet)	Existing Surface c/	Existing Land Use d/	Proposed Improvement e/	Construction Area (acres) f/	Operation Area (acres) g/
TAR	TA-AL-167	61.1	Existing	Temporary	Private	25	739	D	AG, CI, FW, OL	S, W	0.43	0.00
TAR	TA-AL-168	61.6	Existing	Temporary	Private	25	578	G, Gr	AG, CI, FW, OL	S, W	0.34	0.00
TAR	TA-AL-169	62.4	Existing	Temporary	Private	25	1,945	D	FW, OL, OW, RD, WL	S, W	1.12	0.00
TAR	TA-AL-171	63.4	Existing	Temporary	Private	25	561	D, Gr	AG, OL	S, W	0.33	0.00
TAR	TA-AL-172	63.7	New	Temporary	Private	25	2,384	Gr	CI, FW, OL, SC	S, W	1.38	0.00
PAR	PA-AL-175A	64.8	New	Permanent	Private	25	40	Gr	CI, OL	S, W	0.01	0.01
TAR	TA-AL-179A	66.7	Existing	Temporary	Private	25	3,927	G, Gr	CI, FW, OL	S, W	2.25	0.00
TAR	TA-AL-180	67.3	New	Temporary	Private	25	2,269	G, Gr	AG, CI, FW, OL, RD	S, W	1.33	0.00
TAR	TA-AL-181	68.0	Existing	Temporary	Private	25	1,546	G, D	CI, FW, OL, RD	S, W	0.89	0.00
PAR	PA-AL-181A	68.2	Existing	Permanent	Private	25	2,089	G	FW, OL, RD	S, W	1.20	1.20
TAR	TA-AL-185	68.9	Existing	Temporary	Private	25	1,586	Gr	FW, OL	S, W	0.92	0.00
TAR	TA-AL-186	69.2	Existing	Temporary	Private	25	11	G, Gr	FW, RD	S, W	0.02	0.00
TAR	TA-AL-187	69.5	Existing	Temporary	Private	25	1,258	A, G, Gr	CI, FW, RD	S, W	0.72	0.00
TAR	TA-AL-188	70.9	Existing	Temporary	Private	25	1,702	C, D	CI, FW, OL	S, W	1.02	0.00
TAR	TA-AL-189	71.2	Existing	Temporary	Private	25	2,151	Gr	FW, OL	S, W	1.32	0.00
TAR	TA-AL-190	71.5	Existing	Temporary	Alamance Community College	25	1,512	A, G, Gr	CI, FW, OL	S, W	0.88	0.00
TAR	TA-AL-192	72.2	Existing	Temporary	Private	25	1,275	G, D, Gr	CI, FW, OL, RD	S, W	0.74	0.00
TAR	TA-AL-193	72.4	Existing	Temporary	Private	25	1,293	Gr	CI, FW, OL	S, W	0.74	0.00
PAR	PA-AL-194	73.1RR	Existing	Permanent	Transcontinental Gas Pipeline Company, LLC Public Service Company Of North Carolina, Inc. Private	25	205	G	CI, FW, OL	S	0.12	0.12
										North Carolina Subtotal:	*76.11*	*6.92*
										PROJECT TOTAL:	**127.19**	**9.82**

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

a/ TAR=Temporary, PAR=Permanent Access Road.

b/ Milepost (MP) at final intersection of access road with construction workspace. Approximate MP rounded to the nearest tenth.

c/ Dominant surface condition provided. A=Asphalt, C=Concrete, G=Gravel, D=Dirt, Gr=Greenfield.

d/ AG = Agricultural; CI = Commercial / Industrial; FW = Upland Forest / Woodland; OL = Upland Open Land; OW = Open Water; RD = Residential; SC = Silviculture; WL = Wetland. Where wetlands (WL) are identified within permanent access roads, permanent impacts are not anticipated.

e/ P=Paving, G=Grading, S=Stone, C=Culverts, W=Widening, R=Realignment. No improvements to occur within WLs crossed by the access road.

f/ Does not include area overlapping with pipeline, aboveground facility, or contractor/pipe storage yard construction workspaces.

g/ Does not include area overlapping with pipeline permanent right-of-way or aboveground facility permanent facility boundary (fence line/footprint). Only PARs will have an operational area impact.

APPENDIX B.5

Waterbodies Crossed by the Southgate Project

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Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
Virginia - Pittsylvania								
H-605 Pipeline								
S-F18-6	0.1	Trib. To Little Cherrystone Creek	Intermittent	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
H-650 Pipeline								
S-F18-65	0.4	Little Cherrystone Creek	Perennial	22	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-63	0.6	Trib. To Little Cherrystone Creek	Intermittent	14	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-18	1.1	Trib. To Cherrystone Creek	Perennial	5	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-56	1.4	Trib. To Cherrystone Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-18	1.7	Cherrystone Creek	Perennial	29	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-2	3.2	Trib. To Banister River	Intermittent	8	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-6	3.6	Trib. To Banister River	Intermittent	10	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-10	4.0	Trib. To Banister River	Intermittent	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-9	4.1	Trib. To Banister River	Intermittent	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-4	4.8	Trib. To Banister River	Intermittent	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-3	4.9	Banister River	Perennial	48	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-2	5.0	White Oak Creek	Perennial	33	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-D18-2	5.1	White Oak Creek	Perennial	23	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-36	6.6	Trib. To White Oak Creek	Intermittent	5	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-7	7.0	Trib. To White Oak Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-6	7.0	Trib. To White Oak Creek	Intermittent	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-13	7.6	Trib. To White Oak Creek	Perennial	3	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-13	8.0	Trib. To White Oak Creek	Intermittent	9	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-16	8.5	Trib. To White Oak Creek	Intermittent	8	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-14	8.6	Trib. To White Oak Creek	Perennial	9	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
WB-E18-24	9.0	Trib. To White Oak Creek	Pond	23	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-15	9.9	Trib. To White Oak Creek	Perennial	3	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-17	9.9	White Oak Creek	Perennial	14	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-22	11.0	Trib. To Sandy Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A
S-F18-20	11.0	Trib. To Sandy Creek	Perennial	27	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-20	11.0	Trib. To Sandy Creek	Perennial	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-20	11.0	Trib. To Sandy Creek	Perennial	9	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-28	11.4	Trib. To Sandy Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-F18-20	11.4	Trib. To Sandy Creek	Perennial	12	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-C18-85	11.6	Trib. To Sandy Creek	Perennial	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-C18-86	11.9	Trib. To Sandy Creek	Perennial	23	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-21	12.8	Sandy Creek	Perennial	15	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-27	13.4	Trib. To Sandy Creek	Perennial	11	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-22	14.3	Trib. To Sandy Creek	Perennial	12	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-47	14.7	Trib. To Sandy Creek	Perennial	3	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-A18-188	15.2	Trib. To Silver Creek	Perennial	5	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-37	15.7	Trib. To Silver Creek	Perennial	24	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-A18-190	15.9	Trib. To Silver Creek	Intermittent	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-A18-194	16.0	Trib. To Silver Creek	Perennial	7	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-A18-195	16.2	Trib. To Silver Creek	Perennial	2	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-G18-10	16.2	Trib. To Silver Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A
S-C18-97	16.8	Trib. To Sandy River	Intermittent	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-B18-202	17.0	Trib. To Sandy River	Perennial	3	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-51	17.3	Trib. To Sandy River	Perennial	12	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-E18-44	17.7 RR	Sandy River	Perennial	113	Intermediate	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-A19-292	17.8 RR	Trib.to Sandy River	Perennial	6	Minor	WWH	AL,R,W	Open Cut – Dam and pump, Flume
S-E18-42	18.0	Trib. To Hardys Creek	Perennial	6	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-D18-38	19.4	Trib. To Sandy River	Ephemeral	4	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-F18-50	19.7	Trib. To Sandy River	Perennial	9	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-52	20.4	Trib. To Trayner Branch	Perennial	14	Intermediate	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-E18-54	20.6	Trib. To Trayner Branch	Perennial	6	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-D18-34	21.0	Trayner Branch	Perennial	7	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-D18-40	21.2	Trib. To Trayner Branch	Perennial	5	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-C18-94	21.7	Trib. To Trotters Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A
WB-C18-93	21.9	Trib. To Trotters Creek	Pond	0	Minor	WWH	AL, R, FC, W	N/A
S-A18-205	22.0	Trib. To Trotters Creek	Intermittent	19	Intermediate	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-A18-203	22.1	Trib. To Trotters Creek	Intermittent	<1	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-A18-206	22.2	Trib. To Trotters Creek	Intermittent	9	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-F18-43	23.0	Trib. To Trotters Creek	Intermittent	4	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-F18-42	23.2	Trib. To Trotters Creek	Ephemeral	10	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-F18-40	23.2	Trotters Creek	Perennial	22	Intermediate	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-F18-38	23.5	Trib. To Dan River	Intermittent	4	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-F18-35	23.8	Trib. To Dan River	Ephemeral	7	Minor	WWH	AL, R, FC, W	Open Cut - Dam and pump, Flume
S-E18-34	23.9	Trib. To Dan River	Intermittent	0	Minor	WWH	AL, R, FC, W, PWS	N/A
S-F18-34	24.4	Trib. To Dan River	Ephemeral	7	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-F18-33	24.8	Trib. To Dan River	Perennial	9	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-C18-89	25.1	Trib. To Dan River	Perennial	19	Intermediate	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-C18-90	25.7	Trib. To Dan River	Perennial	11	Intermediate	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
S-C18-92	25.9	Trib. To Dan River	Intermittent	7	Minor	WWH	AL, R, FC, W, PWS	Open Cut - Dam and pump, Flume
North Carolina - Rockingham								
S-B18-99	26.5	Trib. To Cascade Creek	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-42	27.3	Trib. To Cascade Creek	Intermittent	20	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-40	27.5	Cascade Creek	Perennial	108	Major	WWH	Class C	Conventional Bore
S-A19-273	27.5	Dry Creek	Perennial	29	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-31	28.3 RR	Trib. To Dan River	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-32	28.4 RR	Trib. To Dan River	Perennial	14	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-34	28.4 RR	Trib. To Dan River	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-36	28.4 RR	Trib. To Dan River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-37	28.6 RR	Trib. To Dan River	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-49	28.8	Trib. To Dan River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-47	29.1	Trib. To Dan River	Ephemeral	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-160	29.3 RR	Trib. To Dan River	Ephemeral	0	Minor	WWH	Class C	N/A
S-A18-47	29.6	Trib. To Dan River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-17	30.1	Dan River	Perennial	247	Major	WWH	Class C	HDD
S-B18-38	30.3	Trib. To Dan River	Ephemeral	3	Minor	WWH	Class C	HDD
S-B18-104	30.8 RR	Trib. To Rock Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-153	30.9 RR	Trib. To Rock Creek	Intermittent	2	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-B18-105	31.1	Trib. To Rock Creek	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-102	31.1	Trib. To Rock Creek	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-95	31.3	Rock Creek	Perennial	28	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-143	31.9	Trib. To Machine Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-140	31.9	Trib. To Machine Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-144	32.0	Trib. To Machine Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-140	32.0	Trib. To Machine Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-148	32.1	Trib. To Machine Creek	Ephemeral	0	Minor	WWH	Class C	N/A
S-A18-147	32.2	Machine Creek	Perennial	20*	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-150	32.5	Trib. To Town Creek	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-153	32.6	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-151	32.7 RR	Town Creek	Perennial	55	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-151	33.0	Town Creek	Perennial	48	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-154	33.0	Trib. To Town Creek	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-154	33.0	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-154	33.0	Trib. To Town Creek	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-220	33.3	Trib. To Town Creek	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-221	33.3	Trib. To Town Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-52	33.4	Trib. To Town Creek	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-51	33.5	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-223	33.7	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-225	33.7	Trib. To Town Creek	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-49	33.9	Trib. To Town Creek	Intermittent	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-48	34.0	Trib. To Town Creek	Ephemeral	0	Minor	WWH	Class C	N/A
S-C18-38	34.2 RR	Trib. To Town Creek	Perennial	33	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-39	34.5	Trib. To Town Creek	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-38	34.6	Trib. To Town Creek	Perennial	17	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-53	34.7	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-38	34.8	Trib. To Town Creek	Perennial	23	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-74	34.8	Trib. To Town Creek	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-38	35.0	Trib. To Town Creek	Perennial	7	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-57	35.1	Trib. To Town Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-35	36.0	Trib. To Town Creek	Perennial	10	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-94	37.0	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-97	37.2	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-101	37.3	Trib. To Wolf Island Creek	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-157	37.6 RR	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	Open Cute – Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
AS-B18-117	37.7	Trib. To Wolf Island Creek	Perennial	12	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-2	38.2	Trib. To Wolf Island Creek	Perennial	21	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-9	38.4	Trib. To Wolf Island Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-4	38.5	Trib. To Wolf Island Creek	Perennial	0	Minor	WWH	Class C	N/A
S-A18-4	38.5	Trib. To Wolf Island Creek	Perennial	0	Minor	WWH	Class C	N/A
S-A18-8	38.8	Wolf Island Creek	Perennial	53	Intermediate	WWH	Class C	Conventional Bore
S-A19-269	38.8 RR	Trib. To Wolf Island Creek	Intermittent	2	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-B18-72	39.0	Trib. To Wolf Island Creek	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-73	39.1	Trib. To Wolf Island Creek	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-74	39.1	Trib. To Wolf Island Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-74	39.6	Trib. To Wolf Island Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-108	40.2	Trib. To Lick Fork	Perennial	27	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-109	40.2	Trib. To Lick Fork	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-210	40.5 RR	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-210	40.5 RR	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-51	40.6	Trib. To Lick Fork	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-B18-52	40.7	Trib. To Lick Fork	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-57	41.1	Trib. To Lick Fork	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-56	41.2 RR	Lick Fork	Perennial	39	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-171	41.2	Trib. To Lick Fork	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-B18-44	41.6	Trib. To Lick Fork	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-45	41.7	Trib. To Lick Fork	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-44	41.7	Trib. To Lick Fork	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-41	41.8	Trib. To Lick Fork	Perennial	19	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-89	42.3	Trib. To Jones Creek	Ephemeral	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-256	42.9	Trib. To Jones Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-92	43.1	Trib. To Jones Creek	Perennial	12	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-176	43.3	Jones Creek	Perennial	26	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-181	43.3	Trib. To Jones Creek	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-80	43.7	Trib. To Jones Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-105	43.7	Trib. To Jones Creek	Perennial	53	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-25	44.1	Trib. To Jones Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-102	44.1	Trib. To Jones Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-226	44.4	Trib. To Jones Creek	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-228	44.5	Trib. To Jones Creek	Ephemeral	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-213	45.7	Trib. To Hogans Creek	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-71	45.7	Trib. To Hogans Creek	Perennial	23	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-68	45.8	Trib. To Hogans Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-231	46.4	Trib. To Hogans Creek	Ephemeral	0	Minor	WWH	Class C	N/A
S-A18-234	46.5	Trib. To Hogans Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-235	46.5	Trib. To Hogans Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-76	47.0	Hogans Creek	Perennial	19	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-79	47.4	Trib. To Hogans Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-90	47.6	Trib. To Hogans Creek	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-167	47.7 RR	Trib. To Hogans Creek	Intermittent	3	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-A18-242	47.7	Trib. To Hogans Creek	Perennial	19	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-60	48.7	Giles Creek	Perennial	4	Minor	WWH	Class C, WS-IV, NSW	Open Cut - Dam and pump, Flume
S-A18-55	49.3	Trib. To Giles Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-183	49.9 RR	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-185	49.9 RR	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-A18-182 / S-A18-182	49.9 RR	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-244	50.2 RR	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A19-289	50.7 RR	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A19-286	50.8 RR	Trib. To Haw River	Perennial	43	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A19-286	50.8 RR	Trib. To Haw River	Perennial	29*	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
AS-A19-285	51.2 RR	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
S-C18-22	51.3 RR	Trib. To Haw River	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-21	51.4 RR	Trib. To Haw River	Perennial	0	Minor	WWH	Class C	N/A
WB-C18-19	51.4 RR	Trib. To Haw River	Pond	0	Minor	WWH	Class C	N/A
S-C18-15	52.1	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-217	52.1	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
AS-A18-219	52.4 RR	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
North Carolina - Alamance								
S-B18-94	52.7	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-84	53.7	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-87	53.7	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-89	54.0	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
S-C18-63	54.5	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-62	54.6	Trib. To Haw River	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-60	54.9	Trib. To Haw River	Intermittent	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-143	54.9	Trib. To Haw River	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-142	54.9	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-61	54.9	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-68	55.2	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-59	55.3	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-59	55.3	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-59	55.3	Trib. To Haw River	Perennial	0	Minor	WWH	Class C	N/A
S-B18-65	56.4	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-120	56.4	Trib. To Haw River	Perennial	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
WB-A18-121	56.5	Trib. To Haw River	Pond	32	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

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S-A18-125	56.5	Trib. To Haw River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-125	56.6	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-126	56.6	Trib. To Haw River	Ephemeral	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-125	56.6	Trib. To Haw River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-132	57.1	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A19-290	57.5 RR	Trib. To Haw River	Ephemeral	0	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-2	57.9	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-13	58.7	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-11	58.7	Trib. To Haw River	Perennial	79	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-12	58.7	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
AS-NHD-1549	59.6	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-30	60.7	Trib. To Haw River	Intermittent	13	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-28	60.8	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-78	61.8	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-77	61.8	Trib. To Haw River	Ephemeral	0	Minor	WWH	Class C	N/A
S-A18-70	62.4	Trib. To Haw River	Perennial	19	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume

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S-A18-72	62.5	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-23	63.0	Trib. To Stony Creek Reservoir	Ephemeral	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-24	63.0	Trib. To Stony Creek Reservoir	Perennial	0	Minor	WWH	Class C	N/A
S-B18-22	63.0	Trib. To Stony Creek Reservoir	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-22	63.1	Trib. To Stony Creek Reservoir	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-26	63.1	Trib. To Stony Creek Reservoir	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-12	63.1	Trib. To Stony Creek Reservoir	Perennial	6	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-12	63.1	Trib. To Stony Creek Reservoir	Perennial	6	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-29	63.1	Trib. To Stony Creek Reservoir	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-12	63.1	Trib. To Stony Creek Reservoir	Perennial	6	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-14	63.2	Trib. To Stony Creek Reservoir	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-12	63.2	Trib. To Stony Creek Reservoir	Perennial	0	Minor	WWH	Class C	N/A
S-B18-12	63.2	Trib. To Stony Creek Reservoir	Perennial	21	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-15	63.5	Trib. To Stony Creek Reservoir	Intermittent	0	Minor	WWH	Class C	N/A
AS-B18-16 / S-B18-16	63.6	Stony Creek Reservoir	Perennial	305	Major	WWH	Class C, WS-II, HQW, NSW, CA	HDD
AS-B18-20	63.8	Trib. To Deep Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

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Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
AS-NHD-1547	64.0	Deep Creek	Perennial	9	Minor	WWH	Class C, WS-II, HQW, NSW, CA	Conventional Bore
AS-NHD-3040	64.5	Trib. To Deep Creek	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A19-319	65.0 RR	Trib. To Boyds Creek	Intermittent	0	Minor	WWH	Class C	N/A
S-A19-321	65.1 RR	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-A19-324	65.1 RR	Trib. To Boyds Creek	Perennial	3	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-A18-251	65.6	Trib. To Boyds Creek	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-NHD-3025	66.8 RR	Trib. To Boyds Creek	Intermittent	5	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
AS-A18-177	67.3 RR	Trib. To Boyds Creek	Perennial	5	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
AS-A18-180	67.3 RR	Trib. To Boyds Creek	Intermittent	3	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
AS-A18-177	67.3 RR	Trib. To Boyds Creek	Perennial	0	Minor	WWH	Class C	N/A
S-B18-80	67.3 RR	Trib. To Boyds Creek	Intermittent	1	Minor	WWH	Class C	Open Cut – Dam and pump, Flume
S-A18-250	65.6	Trib. To Boyds Creek	Perennial	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-A18-233 / S-A18-233	67.6	Boyds Creek	Perennial	24	Intermediate	WWH	Class C, WS-V, NSW	Open Cut - Dam and pump, Flume
AS-NHD-1551	68.1	Trib. To Boyds Creek	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-7	68.4	Trib. To Boyds Creek	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-NHD-1552	68.6	Trib. To Boyds Creek	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-B18-8	68.8	Trib. To Haw River	Intermittent	12	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-11	68.9	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-10	69.1	Trib. To Haw River	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-15	69.2	Trib. To Haw River	Intermittent	4	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-B18-132	69.5	Trib. To Haw River	Perennial	8	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-147	69.7	Trib. To Haw River	Ephemeral	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-174	69.8	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
AS-A18-115	69.9	Trib. To Haw River	Perennial	18	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-135	70.3	Trib. To Haw River	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-134	70.3	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-133	70.3	Trib. To Haw River	Perennial	11	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-82	70.4	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-C18-81	70.7	Trib. To Haw River	Perennial	24	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-109	70.9	Trib. To Haw River	Perennial	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-108	71.0	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-107	71.0	Trib. To Haw River	Ephemeral	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-A18-64	71.5	Trib. To Haw River	Perennial	26	Intermediate	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-65	71.6	Trib. To Haw River	Intermittent	1	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-68	71.8	Trib. To Haw River	Perennial	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
AS-NHD-1560	72.1	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-A18-207	72.2	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-125	72.4	Trib. To Haw River	Intermittent	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-127	72.5	Trib. To Haw River	Intermittent	5	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-128	72.5	Trib. To Haw River	Ephemeral	2	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B18-129	72.6	Trib. To Haw River	Ephemeral	3	Minor	WWH	Class C	Open Cut - Dam and pump, Flume
S-B19-150	73.0 RR	Trib. To Back Creek	Perennial	0	Minor	WWH	Class C	N/A
Aboveground Facilities								
North Carolina - Rockingham								
AS-A18-248 / S-A18-248 - CY-05	30.6	Trib. To Dry Creek	Ephemeral	0	Minor	WWH	Class C	N/A
S-B18-38 - T-15 Dan River Interconnect	30.3	Trib. To Dan River	Ephemeral	0	Minor	WWH	Class C	N/A
Access Roads								
Virginia - Pittsylvania								
S-D18-20 - TA-PI-005	2.2	Trib. To Cherrystone Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A

Appendix B.5 Waterbodies Crossed by the Southgate Project								
Facility/ State/ County/ Waterbody ID a/	**Approx. MP b/**	**Waterbody Name**	**Flow Type c/**	**Crossing Width (Feet) d/**	**FERC Class e/**	**Fishery Classification f/**	**State Water Quality Classification / Designations g/**	**Crossing Method h/ i/**
S-F18-61 - TA-PI-035	14.2	Trib. To Sandy Creek	Perennial	0	Minor	WWH	AL, R, FC, W	N/A
S-F18-47 - TA-PI-043	17.2	Trib. To Sandy River	Intermittent	1	Minor	WWH	AL, R, FC, W	Bridge or Flume
S-E18-39 - TA-PI-061	22.6	Trib. To Trotters Creek	Intermittent	4	Minor	WWH	AL, R, FC, W	Bridge or Flume
S-E18-38 - TA-PI-061	22.6	Trib. To Trotters Creek	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A
S-E18-41 – TA-PI-061	22.7	Trib. To Trotters Creek	Ephemeral	0	Minor	WWH	AL, R, FC, W	N/A
S-E18-32 - TA-PI-063	24.0	Trib. To Dan River	Intermittent	5	Minor	WWH	AL, R, FC, W	Bridge or Flume
S-C18-88 - TA-PI-067	25.0	Trib. To Dan River	Intermittent	0	Minor	WWH	AL, R, FC, W	N/A
North Carolina - Rockingham								
S-A18-23 - TA-RO-076	28.3 RR	Trib. To Dan River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-27 - TA-RO-076	28.4 RR	Trib. To Dan River	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-19 - TA-RO-080	29.8	Trib. To Dan River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-19 - TA-RO-080	29.7	Trib. To Dan River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-1 - TA-RO-103	38.1	Trib. To Wolf Island Creek	Ephemeral	1	Minor	WWH	Class C	Bridge or Flume
S-B18-42 - TA-RO-113A	41.8	Trib. To Lick Fork	Intermittent	4	Minor	WWH	Class C	Bridge or Flume
S-A18-239 - TA-RO-129	46.7	Trib. To Hogans Creek	Intermittent	0	Minor	WWH	Class C	N/A
S-A18-238 – TA-RO-129	46.7	Trib. To Hogans Creek	Intermittent	0	Minor	WWH	Class C	N/A

Appendix B.5

Waterbodies Crossed by the Southgate Project

Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/
S-C18-71 - TA-RO-139	50.2 RR	Trib. To Haw River	Ephemeral	0	Minor	WWH	Class C	N/A
S-C18-15 - TA-RO-144	52.2	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
North Carolina - Alamance								
S-A18-216 - TA-AL-155	54.6	Trib. To Haw River	Intermittent	2	Minor	WWH	Class C	Bridge or Flume
S-A18-215 - TA-AL-155	54.6	Trib. To Haw River	Perennial	6	Minor	WWH	Class C	Bridge or Flume
S-A18-70 - TA-AL-169	62.4	Trib. To Haw River	Perennial	0	Minor	WWH	Class C	N/A
S-A18-72 - TA-AL-169	62.5	Trib. To Haw River	Intermittent	0	Minor	WWH	Class C	N/A
S-B18-138 - TA-AL-172	63.7	Trib. To Stony Creek Reservoir	Perennial	3	Minor	WWH	Class C	Bridge or Flume
S-B18-137 - TA-AL-172	63.7	Trib. To Stony Creek Reservoir	Intermittent	2	Minor	WWH	Class C	Bridge or Flume

a/ Data is based on waterbody field delineations completed through May 9, 2019 where access has been obtained, National Hydrography Database (NHD), and desktop analysis of approximated resources. "S" indicates stream, "WB" indicates pond, "AS" indicates approximate stream or pond. Approximated streams are also indicated with "*"

b/ MP is closest milepost to waterbody. Mileposts with an “RR” indicate locations where a re-route was incorporated into the pipeline alignment.

c/ Perennial: flowing throughout the year for all or most years, Intermittent: flowing water during certain times of the year, Ephemeral: flowing water only during short periods of the year. For delineated waterbodies, flow type in North Carolina was determined using the NCDWQ Stream Identification Form Version 4.11 and flow type in Virginia has been field estimated. For approximated waterbodies, flow type was estimated based on aerial imagery unless the approximated stream is directly associated with a delineated waterbody in which the approximated waterbody was assigned the same flow type as the associated delineated waterbody.

d/ Crossing width is the intersection of the waterbody and the centerline of the pipeline or access road (unless followed by “*” which indicates the stream width for a parallel pipeline crossing),. For approximated streams, the crossing width was measure using aerial imagery if wide enough to discern, and defaulted to 5 feet if too narrow to be measured using aerial imagery. If the crossing width is “0”, the waterbody is not crossed by the centerline.

e/ FERC Classification from the 2013 FERC Procedures. Minor (<10 feet); Intermediate (>10 - <100 feet); Major (>100 feet).

f/ WWH - Warm Water Habitat.

Appendix B.5 Waterbodies Crossed by the Southgate Project								
Facility/ State/ County/ Waterbody ID a/	Approx. MP b/	Waterbody Name	Flow Type c/	Crossing Width (Feet) d/	FERC Class e/	Fishery Classification f/	State Water Quality Classification / Designations g/	Crossing Method h/ i/

g/ Virginia Water Quality Designations (VADEQ, 2016b). North Carolina Water Quality Classifications (NCDEQ, 2018d). In Virginia AL = Aquatic Life, R = Recreation, W = Wildlife, FC = Fish Consumption, PWS = PUBLIC Water Source. In North Carolina WS-II = Water Supply II, WA-IV = Water Supply IV, WS-V = Water Supply V, HQW = High Quality Waters, NSW = Nutrient Sensitive Waters

h/ June 1 through November 30 is the FERC mandated warmwater habitat construction window; in-water work, except that required to install or remove equipment bridges, must be completed between these dates unless expressly permitted or further restricted in writing on a site-specific basis by the appropriate federal or state agency. Construction timing windows for mussels may be applicable depending on final consultation with the applicable agencies.

i/ Conventional Open-Cut Crossing will only be used when there is no discernable flow within the waterbody at the time of crossing. Dry Open-Cut Crossing will consist of either Flume, Dam and Pump, or Cofferdam. N/A indicates that the waterbody is not crossed by centerline.

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APPENDIX B.6

Wetlands Crossed by the Southgate Project

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Appendix B.6

Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-F18-7	Virginia	Pittsylvania	H-605 Pipeline	PEM	0.1	11	<0.01	<0.01	Open-cut
W-F18-11	Virginia	Pittsylvania	H-650 Pipeline	PFO	0.2	57	0.12	0.04	Open-cut
W-F18-66	Virginia	Pittsylvania	H-650 Pipeline	PEM	0.4	377	0.48	0.08	Open-cut
W-F18-66	Virginia	Pittsylvania	H-650 Pipeline	PFO	0.4	0	0.14	0	Workspace
W-F18-64	Virginia	Pittsylvania	H-650 Pipeline	PEM	0.6	234	0.36	0.05	Open-cut
W-G18-2	Virginia	Pittsylvania	H-650 Pipeline	PEM	1	13	0.04	<0.01	Open-cut
W-G18-2	Virginia	Pittsylvania	H-650 Pipeline	PFO	1	0	<0.01	<0.01	Workspace
W-F18-57	Virginia	Pittsylvania	H-650 Pipeline	PEM	1.1	0	<0.01	0	Workspace
W-F18-57	Virginia	Pittsylvania	H-650 Pipeline	PEM	1.1	0	<0.01	0	Workspace
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	1.4	156	0.16	0.1	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PEM	1.4	0	0.01	<0.01	Workspace
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	1.4	11	0.01	<0.01	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	1.4	255	0.39	0.16	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PEM	1.6	770	1.25	0.18	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PSS	1.5	0	0.14	0	Workspace
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PEM	1.7	55	0.07	0.01	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PSS	1.8	362	0.45	0.08	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	1.9	290	0.34	0.2	Open-cut
W-F18-5	Virginia	Pittsylvania	H-650 Pipeline	PEM	2	1470	2.9	0.34	Open-cut
W-D18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	3.6	44	0.07	0.02	Open-cut
W-D18-5	Virginia	Pittsylvania	H-650 Pipeline	PFO	3.6	2	<0.01	<0.01	Open-cut
W-D18-11	Virginia	Pittsylvania	H-650 Pipeline	PFO	4	0	<0.01	0	Workspace
W-D18-11	Virginia	Pittsylvania	H-650 Pipeline	PFO	4	5	<0.01	<0.01	Open-cut
W-D18-7	Virginia	Pittsylvania	H-650 Pipeline	PFO	4.9	373	0.46	0.25	Open-cut
W-D18-7	Virginia	Pittsylvania	H-650 Pipeline	PEM	4.9	9	0.2	0.01	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5	14	0.02	<0.01	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5	123	0.18	0.07	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5.1	87	0.15	0.05	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5.2	309	0.51	0.21	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5.2	0	0.06	0	Workspace

Appendix B.6

Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5.2	112	0.31	0.08	Open-cut
W-D18-1	Virginia	Pittsylvania	H-650 Pipeline	PFO	5.2	10	0	0	Bore
W-D18-10	Virginia	Pittsylvania	H-650 Pipeline	PFO	6.5	0	0.01	0	Workspace
W-D18-10	Virginia	Pittsylvania	H-650 Pipeline	PEM	6.6	0	0.14	<0.01	Workspace
W-D18-10	Virginia	Pittsylvania	H-650 Pipeline	PFO	6.6	53	0.1	0.04	Open-cut
W-D18-8	Virginia	Pittsylvania	H-650 Pipeline	PEM	7	0	<0.01	0	Workspace
W-D18-8	Virginia	Pittsylvania	H-650 Pipeline	PEM	7	0	<0.01	0	Workspace
W-D18-14	Virginia	Pittsylvania	H-650 Pipeline	PEM	7.6	0	<0.01	0	Workspace
W-D18-14	Virginia	Pittsylvania	H-650 Pipeline	PFO	7.6	0	<0.01	0	Workspace
W-F18-14	Virginia	Pittsylvania	H-650 Pipeline	PEM	8	0	<0.01	0	Workspace
W-F18-14	Virginia	Pittsylvania	H-650 Pipeline	PEM	8	0	<0.01	0	Workspace
W-F18-14	Virginia	Pittsylvania	H-650 Pipeline	PFO	8	3	0.01	<0.01	Open-cut
W-F18-14	Virginia	Pittsylvania	H-650 Pipeline	PEM	8	0	0.01	<0.01	Workspace
W-F18-14	Virginia	Pittsylvania	H-650 Pipeline	PFO	8	5	<0.01	<0.01	Open-cut
W-E18-17	Virginia	Pittsylvania	H-650 Pipeline	PEM	8.4	98	0.16	0.02	Open-cut
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PFO	8.5	94	0.15	0.05	Open-cut
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PEM	8.5	0	0.02	0	Workspace
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PFO	8.6	32	0.05	0.01	Open-cut
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PEM	8.6	0	0.01	0	Workspace
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PFO	8.6	47	0.07	0.03	Open-cut
W-E18-13	Virginia	Pittsylvania	H-650 Pipeline	PEM	8.6	0	0.01	0	Workspace
W-E18-24	Virginia	Pittsylvania	H-650 Pipeline	PFO	9	0	0.01	<0.01	Workspace
W-E18-24	Virginia	Pittsylvania	H-650 Pipeline	PEM	9.1	23	0.09	0	Workspace
W-F18-58	Virginia	Pittsylvania	H-650 Pipeline	PEM	9.7	393	0.09	0	Open-Cut
W-F18-16	Virginia	Pittsylvania	H-650 Pipeline	PFO	9.9	27	0.05	0.01	Open-cut
W-F18-18	Virginia	Pittsylvania	H-650 Pipeline	PFO	9.9	0	0.01	<0.01	Workspace
W-F18-18	Virginia	Pittsylvania	H-650 Pipeline	PFO	9.9	0	<0.01	0	Workspace
W-F18-18	Virginia	Pittsylvania	H-650 Pipeline	PFO	9.9	40	0.06	0.03	Open-cut
W-E18-23	Virginia	Pittsylvania	H-650 Pipeline	PEM	10.1	0	<0.01	0	Workspace
W-E18-23	Virginia	Pittsylvania	H-650 Pipeline	PFO	10.1	4	0.01	<0.01	Open-cut

Appendix B.6

Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-F18-24	Virginia	Pittsylvania	H-650 Pipeline	PFO	11	0	0.03	0	Workspace
W-F18-21	Virginia	Pittsylvania	H-650 Pipeline	PFO	11	0	<0.01	0	Workspace
W-F18-21	Virginia	Pittsylvania	H-650 Pipeline	PFO	11.1	0	<0.01	0	Workspace
W-F18-29	Virginia	Pittsylvania	H-650 Pipeline	PFO	11.4	0	<0.01	0	Workspace
W-F18-27	Virginia	Pittsylvania	H-650 Pipeline	PFO	11.4	0	<0.01	<0.01	Workspace
W-C18-84	Virginia	Pittsylvania	H-650 Pipeline	PFO	11.6	29	0.06	0.01	Open-cut
W-C18-84	Virginia	Pittsylvania	H-650 Pipeline	PFO	11.6	20	0.02	<0.01	Open-cut
W-F18-53	Virginia	Pittsylvania	H-650 Pipeline	PFO	12.8	8	<0.01	<0.01	Open-cut
W-F18-53	Virginia	Pittsylvania	H-650 Pipeline	PFO	12.8	0	<0.01	0	Workspace
W-F18-53	Virginia	Pittsylvania	H-650 Pipeline	PFO	12.8	6	<0.01	<0.01	Open-cut
W-F18-53	Virginia	Pittsylvania	H-650 Pipeline	PFO	12.8	0	<0.01	0	Workspace
W-E18-28	Virginia	Pittsylvania	H-650 Pipeline	PFO	13.4	63	0.11	0.03	Open-cut
W-E18-28	Virginia	Pittsylvania	H-650 Pipeline	PFO	13.4	0	<0.01	0	Workspace
W-E18-28	Virginia	Pittsylvania	H-650 Pipeline	PFO	13.5	26	0.06	0.02	Open-cut
W-E18-28	Virginia	Pittsylvania	H-650 Pipeline	PFO	13.5	24	0.04	0.02	Open-cut
W-D18-23	Virginia	Pittsylvania	H-650 Pipeline	PFO	14.3	56	0.12	0.04	Open-cut
W-E18-45	Virginia	Pittsylvania	H-650 Pipeline	PEM	14.7	0	<0.01	0	Workspace
W-E18-45	Virginia	Pittsylvania	H-650 Pipeline	PEM	14.7	0	<0.01	0	Workspace
W-E18-45	Virginia	Pittsylvania	H-650 Pipeline	PEM	14.7	3	<0.01	<0.01	Open-cut
W-E18-45	Virginia	Pittsylvania	H-650 Pipeline	PEM	14.7	0	<0.01	0	Workspace
W-A18-198	Virginia	Pittsylvania	H-650 Pipeline	PEM	16.2	39	0.03	0.01	Open-cut
W-A18-198	Virginia	Pittsylvania	H-650 Pipeline	PFO	16.2	0	<0.01	0	Workspace
W-A18-200	Virginia	Pittsylvania	H-650 Pipeline	PSS	16.7	0	0.05	0	Workspace
W-A18-201	Virginia	Pittsylvania	H-650 Pipeline	PEM	16.7	0	0.02	0	Workspace
W-A18-201	Virginia	Pittsylvania	H-650 Pipeline	PEM	16.8	0	0.02	<0.01	Workspace
W-A19-296	Virginia	Pittsylvania	H-650 Pipeline	PFO	17.7	34	0.16	0.02	Open-cut
W-E18-43	Virginia	Pittsylvania	H-650 Pipeline	PEM	18	0	0.01	0	Workspace
W-E18-43	Virginia	Pittsylvania	H-650 Pipeline	PFO	18	0	<0.01	0	Workspace
W-E18-43	Virginia	Pittsylvania	H-650 Pipeline	PFO	18	0	<0.01	0	Workspace
W-D18-42	Virginia	Pittsylvania	H-650 Pipeline	PEM	19.4	0	0.03	0	Workspace

Appendix B.6

Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-F18-51	Virginia	Pittsylvania	H-650 Pipeline	PFO	19.7	0	<0.01	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	0	0.04	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	0	<0.01	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	0	<0.01	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	0	<0.01	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	6	<0.01	<0.01	Open-cut
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	0	<0.01	0	Workspace
W-E18-53	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.4	3	<0.01	<0.01	Open-cut
W-E18-55	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.6	0	<0.01	0	Workspace
W-E18-55	Virginia	Pittsylvania	H-650 Pipeline	PEM	20.6	3	<0.01	<0.01	Open-cut
W-D18-35	Virginia	Pittsylvania	H-650 Pipeline	PFO	21	54	0.08	0.04	Open-cut
W-D18-35	Virginia	Pittsylvania	H-650 Pipeline	PEM	21	0	0.04	0	Workspace
W-D18-41	Virginia	Pittsylvania	H-650 Pipeline	PEM	21.2	47	0.09	0.01	Open-cut
W-D18-41	Virginia	Pittsylvania	H-650 Pipeline	PFO	21.2	7	0.01	<0.01	Open-cut
W-D18-41	Virginia	Pittsylvania	H-650 Pipeline	PFO	21.2	75	0.09	0.04	Open-cut
W-D18-41	Virginia	Pittsylvania	H-650 Pipeline	PEM	21.3	7	0.09	0.02	Open-cut
W-C18-95	Virginia	Pittsylvania	H-650 Pipeline	PEM	21.7	0	0.03	0	Workspace
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PFO	22	0	<0.01	0	Workspace
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PFO	22	2	0.02	<0.01	Open-cut
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PFO	22	40	0.1	0.03	Open-cut
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PEM	22.1	0	0.02	0	Workspace
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PEM	22.1	0	0.01	0	Workspace
W-A18-204	Virginia	Pittsylvania	H-650 Pipeline	PFO	22.1	18	0.02	0.01	Open-cut
W-F18-44	Virginia	Pittsylvania	H-650 Pipeline	PEM	23	0	0.01	0	Workspace
W-G18-16	Virginia	Pittsylvania	H-650 Pipeline	PEM	23.5	0	0.01	0	Workspace
W-F18-36	Virginia	Pittsylvania	H-650 Pipeline	PFO	23.8	0	<0.01	0	Workspace
W-E18-33	Virginia	Pittsylvania	H-650 Pipeline	PFO	23.9	0	<0.01	0	Workspace
W-E18-33	Virginia	Pittsylvania	H-650 Pipeline	PFO	23.9	0	0.01	0	Workspace
W-A19-297	Virginia	Pittsylvania	H-650 Pipeline	PEM	24.6	0	0.01	0	Workspace
W-C18-91	Virginia	Pittsylvania	H-650 Pipeline	PFO	25.9	18	0.04	0.01	Open-cut

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Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-C18-91	Virginia	Pittsylvania	H-650 Pipeline	PFO	25.8	0	<0.01	0	Workspace
W-C18-96	Virginia	Pittsylvania	H-650 Pipeline	PEM	26.1	0	0.03	<0.01	Workspace
W-C18-96	Virginia	Pittsylvania	H-650 Pipeline	PFO	26.1	97	0.08	0.05	Open-cut
W-C18-96	North Carolina	Rockingham	H-650 Pipeline	PEM	26.1	0	0.03	<0.01	Workspace
W-C18-96	North Carolina	Rockingham	H-650 Pipeline	PFO	26.1	0	<0.01	<0.01	Workspace
W-C18-96	North Carolina	Rockingham	H-650 Pipeline	PFO	26.1	97	0.08	0.05	Open-cut
W-B18-98	North Carolina	Rockingham	H-650 Pipeline	PFO	26.5	15	0.03	0.01	Open-cut
W-A18-22	North Carolina	Rockingham	H-650 Pipeline	PEM	26.7	78	0.15	0.02	Open-cut
W-A18-44	North Carolina	Rockingham	H-650 Pipeline	PEM	27	0	<0.01	0	Workspace
W-A18-44	North Carolina	Rockingham	H-650 Pipeline	PEM	27.1	1,197	3.07	0.27	Open-cut
W-A18-44	North Carolina	Rockingham	H-650 Pipeline	PFO	27.3	38	0.05	0.01	Open-cut
W-A19-274	North Carolina	Rockingham	H-650 Pipeline	PEM	27.6	42	0.19	0.01	Open-cut
W-A19-274	North Carolina	Rockingham	H-650 Pipeline	PEM	27.6	38	0.04	0.01	Open-cut
W-A19-274	North Carolina	Rockingham	H-650 Pipeline	PEM	27.6	0	0.17	0	Workspace
W-A19-39	North Carolina	Rockingham	H-650 Pipeline	PEM	28	0	0.02	0	Workspace
W-A18-26	North Carolina	Rockingham	H-650 Pipeline	PEM	28.1	24	0.06	0.01	Open-cut
W-A18-30	North Carolina	Rockingham	H-650 Pipeline	PEM	28.3	26	0.03	0.01	Open-cut
W-A18-30	North Carolina	Rockingham	H-650 Pipeline	PFO	28.3	18	0.01	0.01	Open-cut
W-A18-38	North Carolina	Rockingham	H-650 Pipeline	PEM	28.6	0	0.02	<0.01	Open-cut
W-A18-38	North Carolina	Rockingham	H-650 Pipeline	PFO	28.6	41	0.04	0.03	Open-cut
W-B18-48	North Carolina	Rockingham	H-650 Pipeline	PFO	29.1	23	0.05	0.02	Open-cut
W-B18-48	North Carolina	Rockingham	H-650 Pipeline	PEM	29.1	0	0.01	<0.01	Workspace
W-A18-18	North Carolina	Rockingham	H-650 Pipeline	PFO	29.7	935	2.33	0.64	Open-cut
W-A18-18	North Carolina	Rockingham	H-650 Pipeline	PEM	29.9	50	0.07	0.01	Open-cut
W-B18-39	North Carolina	Rockingham	H-650 Pipeline	PEM	30.2	25	<0.01	0	HDD
W-B18-39	North Carolina	Rockingham	H-650 Pipeline	PEM	30.2	40	<0.01	0	HDD
W-B18-39	North Carolina	Rockingham	H-650 Pipeline	PEM	30.2	30	<0.01	0	HDD
W-B18-39	North Carolina	Rockingham	H-650 Pipeline	PEM	30.2	32	<0.01	0	HDD
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.2	37	<0.01	0	HDD
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.3	17	<0.01	0	HDD

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Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PFO	30.3	31	<0.01	0	HDD
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.3	18	<0.01	0	HDD
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.4	0	0	0	HDD
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.4	26	0.03	0.01	Open-cut
W-B18-36	North Carolina	Rockingham	H-650 Pipeline	PEM	30.4	0	<0.01	0	Open-cut
W-B18-34	North Carolina	Rockingham	H-650 Pipeline	PFO	30.5	180	0.3	0.12	Open-cut
W-A18-54	North Carolina	Rockingham	H-650 Pipeline	PEM	30.7	11	0.01	<0.01	Open-cut
W-B18-103	North Carolina	Rockingham	H-650 Pipeline	PEM	31.1	0	<0.01	0	Workspace
W-A18-141	North Carolina	Rockingham	H-650 Pipeline	PFO	32	183	0.34	0.13	Open-cut
W-A18-141	North Carolina	Rockingham	H-650 Pipeline	PEM	32	0	0.02	0	Workspace
W-A18-149	North Carolina	Rockingham	H-650 Pipeline	PEM	32.2	52	0.16	0.01	Open-cut
W-A18-149	North Carolina	Rockingham	H-650 Pipeline	PSS	32.2	51	0.07	0.01	Open-cut
W-A18-152	North Carolina	Rockingham	H-650 Pipeline	PEM	32.6	21	0.06	0.01	Open-cut
W-A18-152	North Carolina	Rockingham	H-650 Pipeline	PFO	32.6	29	0.03	0.02	Open-cut
W-A18-155	North Carolina	Rockingham	H-650 Pipeline	PEM	33.1	0	0.06	0	Workspace
W-A18-155	North Carolina	Rockingham	H-650 Pipeline	PSS	33.1	0	<0.01	0	Workspace
W-A18-155	North Carolina	Rockingham	H-650 Pipeline	PSS	33.1	69	0.16	0.02	Open-cut
W-A18-222	North Carolina	Rockingham	H-650 Pipeline	PFO	33.4	43	0.08	0.03	Open-cut
W-A18-222	North Carolina	Rockingham	H-650 Pipeline	PEM	33.4	0	<0.01	0	Workspace
W-A18-224	North Carolina	Rockingham	H-650 Pipeline	PFO	33.7	10	0.02	0.01	Open-cut
W-A18-224	North Carolina	Rockingham	H-650 Pipeline	PEM	33.7	0	<0.01	0	Workspace
W-C18-40	North Carolina	Rockingham	H-650 Pipeline	PEM	34.6	0	<0.01	0	Workspace
W-A18-95	North Carolina	Rockingham	H-650 Pipeline	PEM	37	8	0.02	<0.01	Open-cut
W-A18-98	North Carolina	Rockingham	H-650 Pipeline	PFO	37.2	0	0.01	0	Workspace
W-S18-1	North Carolina	Rockingham	H-650 Pipeline	PFO	37.3	8	0.01	0.01	Open-cut
W-A18-6	North Carolina	Rockingham	H-650 Pipeline	PFO	38.5	130	0.15	0.08	Open-cut
W-A18-6	North Carolina	Rockingham	H-650 Pipeline	PFO	38.5	0	<0.01	0	Workspace
W-A18-6	North Carolina	Rockingham	H-650 Pipeline	PFO	38.5	92	0.09	0.06	Open-cut
W-A18-6	North Carolina	Rockingham	H-650 Pipeline	PEM	38.5	46	0.09	0.01	Open-cut
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PFO	38.6	0	<0.01	0	Workspace

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Wetlands Crossed by the Southgate Project

Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PEM	38.6	76	0.18	0.02	Open-cut
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PSS	38.6	33	0.08	0.01	Open-cut
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PEM	38.6	0	<0.01	0	Workspace
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PEM	38.7	16	0.05	<0.01	Open-cut
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PEM	38.7	29	0.07	0.01	Open-cut
W-A18-7	North Carolina	Rockingham	H-650 Pipeline	PEM	38.7	17	0.04	<0.01	Open-cut
W-A19-270	North Carolina	Rockingham	H-650 Pipeline	PFO	38.8	0	0.02	<0.01	Workspace
W-B18-78	North Carolina	Rockingham	H-650 Pipeline	PFO	39.7	56	0.06	0.03	Open-cut
W-B18-112	North Carolina	Rockingham	H-650 Pipeline	PEM	40.1	0	0.01	0	Workspace
W-B18-110	North Carolina	Rockingham	H-650 Pipeline	PFO	40.2	0	0.02	<0.01	Workspace
W-B18-55	North Carolina	Rockingham	H-650 Pipeline	PEM	41.1	0	0.01	0	Workspace
W-B18-55	North Carolina	Rockingham	H-650 Pipeline	PFO	41.1	84	0.13	0.06	Open-cut
W-B18-46	North Carolina	Rockingham	H-650 Pipeline	PFO	41.7	6	0.02	0.01	Open-cut
W-C18-77	North Carolina	Rockingham	H-650 Pipeline	PFO	47	46	0.08	0.03	Open-cut
W-B18-139	North Carolina	Rockingham	H-650 Pipeline	PFO	48.5	24	0.03	0.02	Open-cut
W-A18-62	North Carolina	Rockingham	H-650 Pipeline	PSS	48.6	40	0.11	0.01	Open-cut
W-A18-62	North Carolina	Rockingham	H-650 Pipeline	PSS	48.6	0	<0.01	0	Workspace
W-A18-61	North Carolina	Rockingham	H-650 Pipeline	PEM	48.7	1	0.01	<0.01	Workspace
W-A18-184	North Carolina	Rockingham	H-650 Pipeline	PEM	49.9	0	0.01	0	Workspace
W-A18-184	North Carolina	Rockingham	H-650 Pipeline	PEM	49.9	0	0.01	0	Workspace
W-A18-184	North Carolina	Rockingham	H-650 Pipeline	PFO	49.9	39	0.06	0.03	Open-cut
W-A19-284	North Carolina	Rockingham	H-650 Pipeline	PSS	51.2	0	0.01	0	Workspace
W-C18-20	North Carolina	Rockingham	H-650 Pipeline	PFO	51.4	19	0.02	0.01	Open-cut
W-C18-20	North Carolina	Rockingham	H-650 Pipeline	PFO	51.4	135	0.21	0.09	Open-cut
W-C18-20	North Carolina	Rockingham	H-650 Pipeline	PEM	51.4	0	<0.01	0.01	Workspace
W-A18-83	North Carolina	Alamance	H-650 Pipeline	PEM	53.3	27	0.06	0.01	Open-cut
W-A18-85	North Carolina	Alamance	H-650 Pipeline	PEM	53.6	9	0.03	<0.01	Open-cut
W-A18-85	North Carolina	Alamance	H-650 Pipeline	PSS	53.7	0	0.04	0	Workspace
W-A18-85	North Carolina	Alamance	H-650 Pipeline	PEM	53.7	0	<0.01	0	Workspace
W-C18-67	North Carolina	Alamance	H-650 Pipeline	PFO	54.3	103	0.26	0.07	Open-cut

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Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-C18-69	North Carolina	Alamance	H-650 Pipeline	PFO	55.3	37	0.07	0.03	Open-cut
W-B18-60	North Carolina	Alamance	H-650 Pipeline	PSS	55.3	0	<0.01	0	Workspace
W-B18-61	North Carolina	Alamance	H-650 Pipeline	PEM	55.5	39	0.06	0.01	Open-cut
W-A18-119	North Carolina	Alamance	H-650 Pipeline	PFO	56.4	95	0.11	0.06	Open-cut
W-A18-119	North Carolina	Alamance	H-650 Pipeline	PEM	56.4	0	0.06	<0.01	Workspace
W-A18-119	North Carolina	Alamance	H-650 Pipeline	PFO	56.5	297	0.47	0.21	Open-cut
W-A18-119	North Carolina	Alamance	H-650 Pipeline	PEM	56.5	0	0.06	0	Workspace
W-A18-127	North Carolina	Alamance	H-650 Pipeline	PEM	56.6	0	0.02	<0.01	Workspace
W-A18-127	North Carolina	Alamance	H-650 Pipeline	PFO	56.6	61	0.07	0.04	Open-cut
W-A18-127	North Carolina	Alamance	H-650 Pipeline	PEM	56.6	0	0.02	<0.01	Workspace
W-A18-130	North Carolina	Alamance	H-650 Pipeline	PEM	56.8	0	0.01	0	Workspace
W-A18-130	North Carolina	Alamance	H-650 Pipeline	PFO	56.9	17	0.09	0.03	Open-cut
W-A18-133	North Carolina	Alamance	H-650 Pipeline	PFO	57.1	56	0.1	0.04	Open-cut
W-A18-133	North Carolina	Alamance	H-650 Pipeline	PEM	57.1	0	0.02	0	Workspace
W-A18-133	North Carolina	Alamance	H-650 Pipeline	PEM	57.1	0	0.01	0	Workspace
W-A18-135	North Carolina	Alamance	H-650 Pipeline	PFO	57.2	146	0.2	0.1	Open-cut
W-A18-135	North Carolina	Alamance	H-650 Pipeline	PEM	57.2	0	0.02	0	Workspace
W-A18-254	North Carolina	Alamance	H-650 Pipeline	PFO	57.6	154	0.22	0.1	Open-cut
W-C18-3	North Carolina	Alamance	H-650 Pipeline	PEM	57.8	13	0.04	<0.01	Open-cut
W-C18-3	North Carolina	Alamance	H-650 Pipeline	PFO	57.9	0	<0.01	0	Workspace
W-C18-3	North Carolina	Alamance	H-650 Pipeline	PEM	57.9	12	0.02	<0.01	Open-cut
W-C18-3	North Carolina	Alamance	H-650 Pipeline	PFO	57.9	8	0.01	0.01	Open-cut
W-C18-5	North Carolina	Alamance	H-650 Pipeline	PSS	58	52	0.07	0.01	Open-cut
W-C18-5	North Carolina	Alamance	H-650 Pipeline	PEM	58	0	0.03	<0.01	Workspace
W-C18-29	North Carolina	Alamance	H-650 Pipeline	PFO	60.8	317	0.55	0.21	Open-cut
W-A18-79	North Carolina	Alamance	H-650 Pipeline	PFO	61.8	0	<0.01	0	Workspace
W-A18-73	North Carolina	Alamance	H-650 Pipeline	PFO	62.5	0	<0.01	<0.01	Workspace
W-A18-74	North Carolina	Alamance	H-650 Pipeline	PFO	62.5	9	0.01	0.01	Open-cut
W-A18-80	North Carolina	Alamance	H-650 Pipeline	PEM	62.7	64	0.09	0.01	Open-cut
W-B18-32	North Carolina	Alamance	H-650 Pipeline	PEM	62.9	0	<0.01	0	Workspace

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Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-B18-28	North Carolina	Alamance	H-650 Pipeline	PFO	63.1	313	0.5	0.21	Open-cut
AW-B18-19	North Carolina	Alamance	H-650 Pipeline	PFO	63.8	50	0.08	0.03	Open-cut
W-A19-320	North Carolina	Alamance	H-650 Pipeline	PEM	65	0	0.03	0	Workspace
W-A19-326	North Carolina	Alamance	H-650 Pipeline	PFO	65.1	6	0.02	0.01	Open-cut
W-A19-323	North Carolina	Alamance	H-650 Pipeline	PEM	65.3	0	0.33	0	Workspace
W-B19-168	North Carolina	Alamance	H-650 Pipeline	PEM	65.6	0	0.28	0	Workspace
W-B19-164	North Carolina	Alamance	H-650 Pipeline	PFO	66.6	9	0.03	0.01	Open-cut
AW-B19-164	North Carolina	Alamance	H-650 Pipeline	PFO	66.6	32	0.05	0.02	Open-cut
W-B18-5	North Carolina	Alamance	H-650 Pipeline	PFO	68.4	16	0.02	0.01	Workspace
W-B19-173	North Carolina	Alamance	H-650 Pipeline	PEM	69.8	0	0.13	0	Workspace
W-A18-67	North Carolina	Alamance	H-650 Pipeline	PFO	71.8	43	0.04	0.03	Open-cut
W-A18-67	North Carolina	Alamance	H-650 Pipeline	PFO	71.8	0	<0.01	0	Workspace
W-A18-208	North Carolina	Alamance	H-650 Pipeline	PEM	72.2	0	<0.01	0	Workspace
W-B19-151	North Carolina	Alamance	H-650 Pipeline	PEM	72.9	258	0.56	0.06	Open-Cut
W-A18-111	North Carolina	Alamance	H-650 Pipeline	PEM	73	0	0.04	0	Workspace
W-B19-151	North Carolina	Alamance	H-650 Pipeline	PEM	73	45	0.04	0.01	Open-Cut
W-F18-11	Virginia	Pittsylvania	Lambert CS / Interconnect / MLV 1	PFO	0	0	0.02	0.02	Under evaluation
W-A18-39	North Carolina	Rockingham	LN 3600 Interconnect	PEM	28	0	<0.01	0	Workspace
W-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.3	0	0.47	0	Workspace
AW-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.3	0	<0.01	0	Workspace
W-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.3	0	<0.01	0	Workspace
W-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.4	0	0.05	0	Workspace
W-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.4	0	0.01	0	Workspace
W-B18-36	North Carolina	Rockingham	T15 Dan River Interconnect	PEM	30.4	0	<0.01	0	Workspace
W-B18-34	North Carolina	Rockingham	T15 Dan River Interconnect	PFO	30.5	0	0.15	0	Workspace
AW-F18-5	Virginia	Pittsylvania	Temporary Access Road	PEM	2.2	58	0.03	0	Workspace
W-F18-1	Virginia	Pittsylvania	Temporary Access Road	PSS	5.2	110	0.05	0	Workspace
W-F18-54	Virginia	Pittsylvania	Temporary Access Road	PEM	20.5	0	<0.01	0	Workspace
W-E18-37	Virginia	Pittsylvania	Temporary Access Road	PFO	22.6	0	<0.01	0	Workspace
W-E18-37	Virginia	Pittsylvania	Temporary Access Road	PFO	22.6	0	<0.01	0	Workspace

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Wetland ID a/	State	County	Facility	Wetland Type b/	Approx. MP	Crossing Length (feet) c/	Total Construction Impacts (acres) d/	Total Operation Impacts (acres) e/	Construction Crossing Method f/
W-C18-87	Virginia	Pittsylvania	Temporary Access Road	PFO	25	106	0.08	0	Workspace
W-C18-87	Virginia	Pittsylvania	Temporary Access Road	PFO	25	0	<0.01	0	Workspace
W-A18-39	North Carolina	Rockingham	Temporary Access Road	PEM	27.9	14	0.01	0	Workspace
W-A18-39	North Carolina	Rockingham	Temporary Access Road	PEM	28.1	0	<0.01	0	Workspace
W-B18-43	North Carolina	Rockingham	Temporary Access Road	PEM	41.8	0	<0.01	0	Workspace
W-B18-43	North Carolina	Rockingham	Temporary Access Road	PEM	41.8	0	0.01	0	Workspace
W-A18-75	North Carolina	Alamance	Temporary Access Road	PEM	62.5	0	0.01	0	Workspace
W-A18-75	North Carolina	Alamance	Temporary Access Road	PEM	62.5	0	0.01	0	Workspace
W-A19-280	North Carolina	Rockingham	Permanent Access Road	PEM	28.7	0	0.01	0	Existing Road; no improvements
W-A19-280	North Carolina	Rockingham	Permanent Access Road	PEM	28.7	0	0.02	0	Existing Road; no improvements
W-B18-34	North Carolina	Rockingham	Permanent Access Road	PFO	30.5	0	<0.01	0	Existing Road; no improvements

a/ Data is based on wetland field delineations completed through May 9, 2019 where access has been obtained, National Wetland Inventory (NWI) data, and desktop analysis of approximated resources. Wetland IDs starting with "W" have been field delineated and wetland ID starting with "AW" are approximated based on NWI data and desktop analysis.

b/ Wetland Classifications PEM = palustrine emergent wetland, PSS = palustrine scrub shrub wetland, PFO = palustrine forested wetland

c/ Crossing length is measured at the intersection of the wetland and centerline of the pipeline or center of the access road. Crossing length of “0” indicates the wetland is not crossed by the centerline of the pipeline, but is located within the construction workspace. Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

d/ Total construction impacts include all wetland impacts (PEM, PFO, PSS) associated with the construction workspace and those within the operational footprint. Wetland impacts of “<0.01” indicates the impact is less than 0.01 acre, but the impact is included in the project totals. Sums may not equal the total of addends due to rounding. Addends consist of six-decimal digits.

e/ Total operation vegetation impacts include PEM, PSS and PFO impacts for vegetation maintenance. Operational vegetation impacts for PEM and PSS wetlands include a 10-foot-wide vegetation maintenance corridor; operational vegetation maintenance impacts for PFO wetlands include a 30-foot-wide vegetation maintenance corridor (i.e., 10-foot-wide cleared corridor and selective removal of trees within 15 feet of the pipeline). Wetland impacts of “<0.01” indicates the impact is less than 0.01 acre, but the impact is included in the project totals. Minor discrepancies in totals are due to rounding.

f/ Construction crossing method will ultimately be determined based on field conditions observed during construction. “Workspace” indicates that the wetland is not crossed by the pipeline but is located within construction workspace.

APPENDIX B.7

Residential Construction Plans

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MVP SOUTHGATE PROJECT

PROPOSED H-650 PIPELINE
ENGINEERING SERVICES DESIGN; JOB NUMBERS 300423
RESIDENTIAL DRAWING NOTES

GENERAL NOTES:

SAFETY FENCE, IN CONJUNCTION WITH ANY PROPOSED EROSION AND SEDIMENTATION CONTROL DEVICES, WILL BE INSTALLED AT THE EDGE OF THE LIMIT OF DISTURBANCE (LOD) FOR A DISTANCE OF 100 FEET ON EITHER SIDE OF THE RESIDENCE OR COMMERCIAL ESTABLISHMENT. FENCING WILL BE MAINTAINED THROUGHOUT ACTIVE CONSTRUCTION IN THE AREA. WHERE NECESSARY, HARD BARRIERS SUCH AS JERSEY BARRIERS WILL BE INSTALLED TO PROVIDE A SOLID, PROTECTIVE BARRIER.

STRUCTURES WITHIN LOD WILL BE REMOVED, RELOCATED, OR PROTECTED PER LAND OWNER AGREEMENT.

PROPERTY LINES DEPICTED ON THIS PLAN ARE BASED ON GIS TAX MAP DATA AND/OR FIELD LOCATED PROPERTY EVIDENCE. THEY SHOULD NOT BE RELIED ON AS AN ACCURATE DEPICTION OF THE ACTUAL PROPERTY LINE LOCATIONS. THEY MAY NOT REPRESENT THE RESULTS OF A BOUNDARY SURVEY.

AREAS OF PERMANENT EASEMENT WILL BE PERMANENTLY MAINTAINED PER USDOT PHMSA REQUIREMENTS. TEMPORARY WORKSPACES WOULD BE ALLOWED TO REVERT BACK TO PRE-EXISTING USES. OTHER MINOR ITEMS WILL BE ADDRESSED THROUGH LANDOWNER STIPULATIONS SPECIFIC TO THE PROPERTY.

CONSTRUCTION CREWS WILL UTILIZE DUST CONTROLS MEASURES AS NEEDED, INCLUDING WETTING AND BRUSHING OF ROADS.

WORK HOURS WILL BE LIMITED TO 7 AM TO 7 PM OR SUNSET (WHICHEVER IS LATER) UNLESS OTHER ARRANGEMENTS HAVE BEEN AGREED UPON WITH LANDOWNER.

CONSTRUCTION METHODS:

THE STOVE PIPE METHOD IS A LESS EFFICIENT ALTERNATIVE TO THE MAINLINE METHOD OF CONSTRUCTION. IT IS TYPICALLY USED WHEN THE PIPELINE IS TO BE INSTALLED IN VERY CLOSE PROXIMITY TO AN EXISTING STRUCTURE OR WHEN AN OPEN DITCH WOULD ADVERSELY IMPACT A COMMERCIAL/RESIDENTIAL ESTABLISHMENT. THE TECHNIQUE INVOLVES INSTALLING PIPE ONE JOINT AT A TIME WHEREBY THE WELDING, X-RAY AND COATING ACTIVITIES ARE ALL PERFORMED IN THE OPEN TRENCH. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED OR THE OPEN TRENCH IS COVERED WITH STEEL PLATES OR TIMBER MATS.

THE DRAG SECTION CONSTRUCTION METHOD, WHILE LESS EFFICIENT THAN MAINLINE METHODS, IS NORMALLY PREFERRED OVER THE STOVE PIPE ALTERNATIVE. THIS TECHNIQUE INVOLVES THE TRENCHING, INSTALLATION AND BACKFILL OF A PREFABRICATED LENGTH OF PIPE CONTAINING SEVERAL SEGMENTS ALL IN ONE DAY. AT THE END OF EACH DAY THE NEWLY INSTALLED PIPE IS BACKFILLED AND/OR COVERED WITH STEEL PLATES OR TIMBER MATS.

MAINLINE CONSTRUCTION IS THE MOST EFFICIENT CONSTRUCTION METHOD. THIS METHOD IS SIMILAR TO STOVE PIPE AND DRAG SECTION INSTALLATION, BUT ON A LARGER SCALE. ALL STEPS OF THE CONSTRUCTION PROCESS (CLEARING, GRADING, TRENCHING, STRINGING & BENDING, WELDING & COATING, LOWERING & BACKFILL) OCCUR OVER LARGE STRETCHES OF RIGHT-OF-WAY TO MAXIMIZE EFFICIENCY OF THE CONSTRUCTION SPREADS. MAINLINE CONSTRUCTION IS TYPICALLY UTILIZED WHERE LARGE STRETCHES OF PIPELINE ROW ARE UNINTERRUPTED. THIS METHOD MAY BE USED NEAR STRUCTURES WHERE OFFSET FROM WORKSPACES IS LARGE ENOUGH TO FACILITATE SAFE AND PRACTICAL IMPLEMENTATION

DRAWN TRC	DATE 05/01/2019	Mountain Valley PIPELINE LLC	RESIDENTIAL NOTES
CHECKED SSL	DATE 05/01/2019		MOUNTAIN VALLEY PIPELINE SOUTHGATE PROJECT PROPOSED H–650 PIPELINE RESIDENTIAL DRAWING NOTES
APP'D	DATE		
SCALE N.T.S.	SHEET 1 OF 2		DRAWING NO. RES–NOTES
JOB NO.			REV. P
PROJECT ID:			

B.7-P

MVP SOUTHGATE PROJECT

PROPOSED H-650 PIPELINE
ENGINEERING SERVICES DESIGN; JOB NUMBERS 300423
RESIDENTIAL DRAWING NOTES

CLEANUP AND REVEGETATION PLANS

SUBSOIL AND TOPSOIL (UP TO 12 INCHES) IN RESIDENTIAL AREAS WILL BE SEGREGATED AND RETURNED TO PRE-CONSTRUCTION GRADE AS SHOWN ON DRAWINGS.

IF SOILS ARE REQUIRED TO BE IMPORTED (E.G. IF TOP SOILING IS NOT PRACTICAL), THEY WILL BE CERTIFIED AS FREE OF NOXIOUS WEEDS AND SOIL PESTS, UNLESS OTHERWISE APPROVED BY THE LANDOWNER. IF TREES ARE NEEDED TO BE REMOVED FROM THE LANDSCAPE FOR CONSTRUCTION, THEY WILL BE REPLACED WITH THE SAME SPECIES OR SIMILAR BASED ON LANDOWNER REQUESTS.

RESTORE ALL TURF, ORNAMENTAL SHRUBS, AND SPECIALIZED LANDSCAPING IN ACCORDANCE WITH THE LANDOWNER'S REQUEST, OR COMPENSATE THE LANDOWNER. RESTORATION WORK MUST BE PERFORMED BY PERSONNEL FAMILIAR WITH LOCAL HORTICULTURAL AND TURF ESTABLISHMENT PRACTICES.

ALL DISTURBED RESIDENTIAL UPLAND AREAS WILL BE MULCHED BEFORE SEEDING IF FINAL GRADING AND INSTALLATION OF PERMANENT EROSION CONTROL MEASURES WILL NOT BE INSTALLED WITHIN 10 DAYS OF COMPLETION.

ALL LAWN AREAS AND IMPACTED LANDSCAPING WILL BE RESTORED FOLLOWING CLEAN-UP OPERATIONS AS SOON AS REASONABLY POSSIBLE, OR AS SPECIFIED IN THE LANDOWNER AGREEMENT. IF SEASONAL OR OTHER WEATHER CONDITIONS PREVENT COMPLIANCE WITH THESE TIME FRAMES, TEMPORARY EROSION CONTROLS (SEDIMENT BARRIERS AND MULCH) WILL BE MAINTAINED UNTIL CONDITIONS ALLOW COMPLETION OF RESTORATION.

IF CRUSHED STONE ACCESS PADS ARE USED IN RESIDENTIAL AREAS THEY WILL BE INSTALLED ON TOP OF SYNTHETIC FABRIC TO FACILITATE EASY REMOVAL.

EXCESS ROCK FROM THE TOP 12 INCHES OF SOIL IN RESIDENTIAL AREAS WILL BE REMOVED UNLESS OTHER ARRANGEMENTS WITH LANDOWNER HAVE BEEN AGREED UPON.

TOPSOIL AND SUBSOIL COMPACTION WILL MEET PRECONSTRUCTION CONDITIONS AND WHERE NECESSARY, SOIL COMPACTION MITIGATION MAY BE REQUIRED TO MITIGATE FOR SEVERELY COMPACTED RESIDENTIAL AREAS.

OTHER RESTORATION DETAILS, INCLUDING REVEGETATION REQUIREMENTS RELATED TO LAWNS, MAY BE SPECIFIC TO LANDOWNER STIPULATIONS.

CONDUCT FOLLOW-UP INSPECTIONS OF ALL DISTURBED AREAS, AS NECESSARY, TO DETERMINE THE SUCCESS OF REVEGETATION AND ADDRESS LANDOWNER CONCERNS. AT A MINIMUM, CONDUCT INSPECTIONS AFTER THE FIRST AND SECOND GROWING SEASONS.

LANDOWNER COMPLAINT RESOLUTION PROCESS

IN THE EVENT OF AN ISSUE, LANDOWNERS ARE DIRECTED TO CONTACT THEIR LOCAL MVP SOUTHGATE LAND REPRESENTATIVE. LANDOWNERS CAN ALSO REACH PROJECT PERSONNEL BY CALLING 1-833-MV-SOUTH OR EMAILING MAIL@MVPSOUTHGATE.COM

AFTER WORKING WITH THE SOUTHGATE PROJECT REPRESENTATIVE AND APPROPRIATE RIGHT-OF-WAY AGENT, IF THE LANDOWNER IS STILL NOT COMPLETELY SATISFIED WITH THE RESOLUTION, THE INDIVIDUAL SHOULD CONTACT THE COMMISSION'S LANDOWNER HELPLINE AT (877) 337-2237, OR BY EMAIL, LANDOWNERHELP@FERC.GOV.

DRAWN TRC	DATE 05/08/2019
CHECKED	DATE
APP'D	DATE
SCALE N.T.S.	SHEET 2 OF 2
JOB NO.	
PROJECT ID:	

RESIDENTIAL NOTES

MOUNTAIN VALLEY PIPELINE
SOUTHGATE PROJECT
PROPOSED H–650 PIPELINE
RESIDENTIAL DRAWING NOTES

DRAWING NO.	REV.
RES–NOTES CONT.	P

B.7-2

MVP SOUTHGATE PROJECT

PROPOSED H-650 PIPELINE
ENGINEERING SERVICES DESIGN; JOB NUMBERS 300423
RESIDENTIAL DRAWING NOTES

Residential Plan Drawing	Anticipated Construction Method	Approximate Construction Duration	Additional Measures	Restoration Plans
RSS-H6S0-001	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-002	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-003	NA - Yard	400 Days	Install hard barriers	See General Restoration Notes
RSS-H6S0-004	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-005	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-006	Stove Pipe	3S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-008	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-009	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-015	Mainline / Drag	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-016	Mainline	1S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-017	Stove Pipe	50 Days	Install hard barriers	See General Restoration Notes
RSS-H6S0-018	Stove Pipe	7S Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-024	NA - Access Road	200 Days	Install hard barriers	See General Restoration Notes
RSS-H6S0-025	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H6S0-026	NA - Access Road	200 Days	Install hard barriers	See General Restoration Notes
RSS-H6S0-027	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-028	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-029	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-030	NA - Access Road	200 Days	Install hard barriers	See General Restoration Notes
RSS-H650-031	Mainline	25 Days	None identified at this time.	See General Restoration Notes
RSS-H650-032	Mainline	15 Days	None identified at this time.	See General Restoration Notes
RSS-H650-033	NA - Yard	400 Days	Install hard barriers	See General Restoration Notes
RSS-H650-034	Mainline	35 Days	None identified at this time.	See General Restoration Notes
RSS-H650-035	Mainline	15 Days	None identified at this time.	See General Restoration Notes
RSS-H650-036	Mainline	15 Days	None identified at this time.	See General Restoration Notes
RSS-H650-037	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-038	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-039	Mainline / Road Bore	25 Days	None identified at this time.	See General Restoration Notes
RSS-H650-040	NA - Access Road	200 Days	None identified at this time.	See General Restoration Notes
RSS-H650-041	Mainline	15 Days	None identified at this time.	See General Restoration Notes
RSS-H650-042	Mainline	15 Days	None identified at this time.	See General Restoration Notes
RSS-H650-043	NA - Yard	400 Days	None identified at this time.	See General Restoration Notes
RSS-H650-044	NA - Yard	400 Days	None identified at this time.	See General Restoration Notes

NOTE:

CONSTRUCTION METHOD AND DURATION MAY CHANGE DUE TO LANDOWNER REQUESTS, FIELDS CONDITIONS, AND OTHER CONSIDERATIONS.

DRAWN TRC	DATE 05/08/2019
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JOB NO.	
PROJECT ID:	

RESIDENTIAL NOTES

MOUNTAIN VALLEY PIPELINE
SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
RESIDENTIAL DRAWING NOTES

DRAWING NO. RES-NOTES SITE SPECIFIC

REV. P2

B.7-4

C/L MP 49.10

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: TBH		10/05/18
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ENGINEERING CK: .		.
DETAIL SHEET:		
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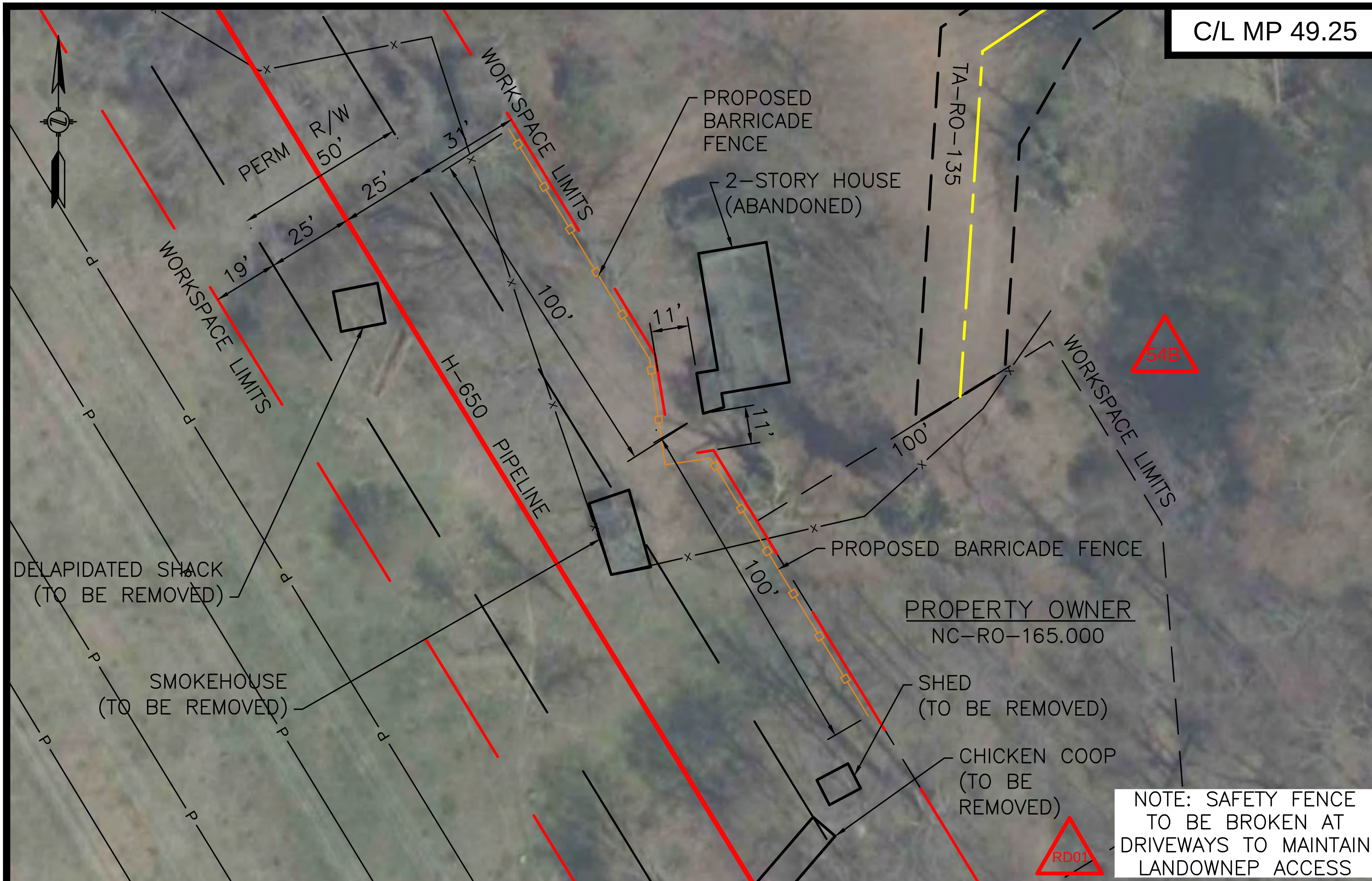

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

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B.7-6

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

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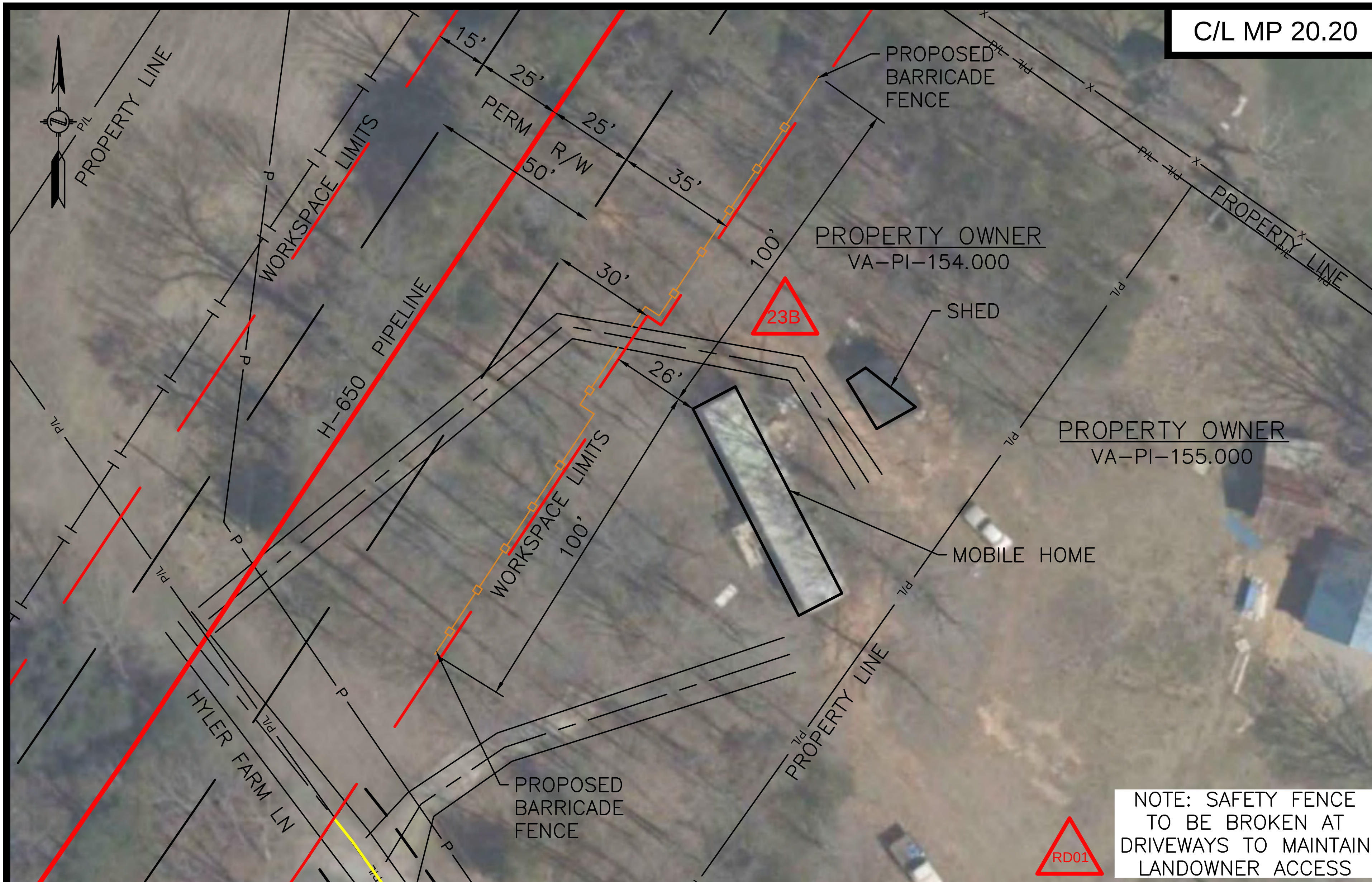

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY,VIRGINIA

SHEET 1 OF 1

DRAWN BY: TBH	10/08/18	
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ENGINEERING CK:		
DETAIL SHEET:		
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DATE OF PLOT: 6/17/2019 12:31 PM		

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY, VIRGINIA

SHEET 1 OF 1

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DETAIL SHEET:		
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DATE OF PLOT: 6/17/2019 12:31 PM		

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

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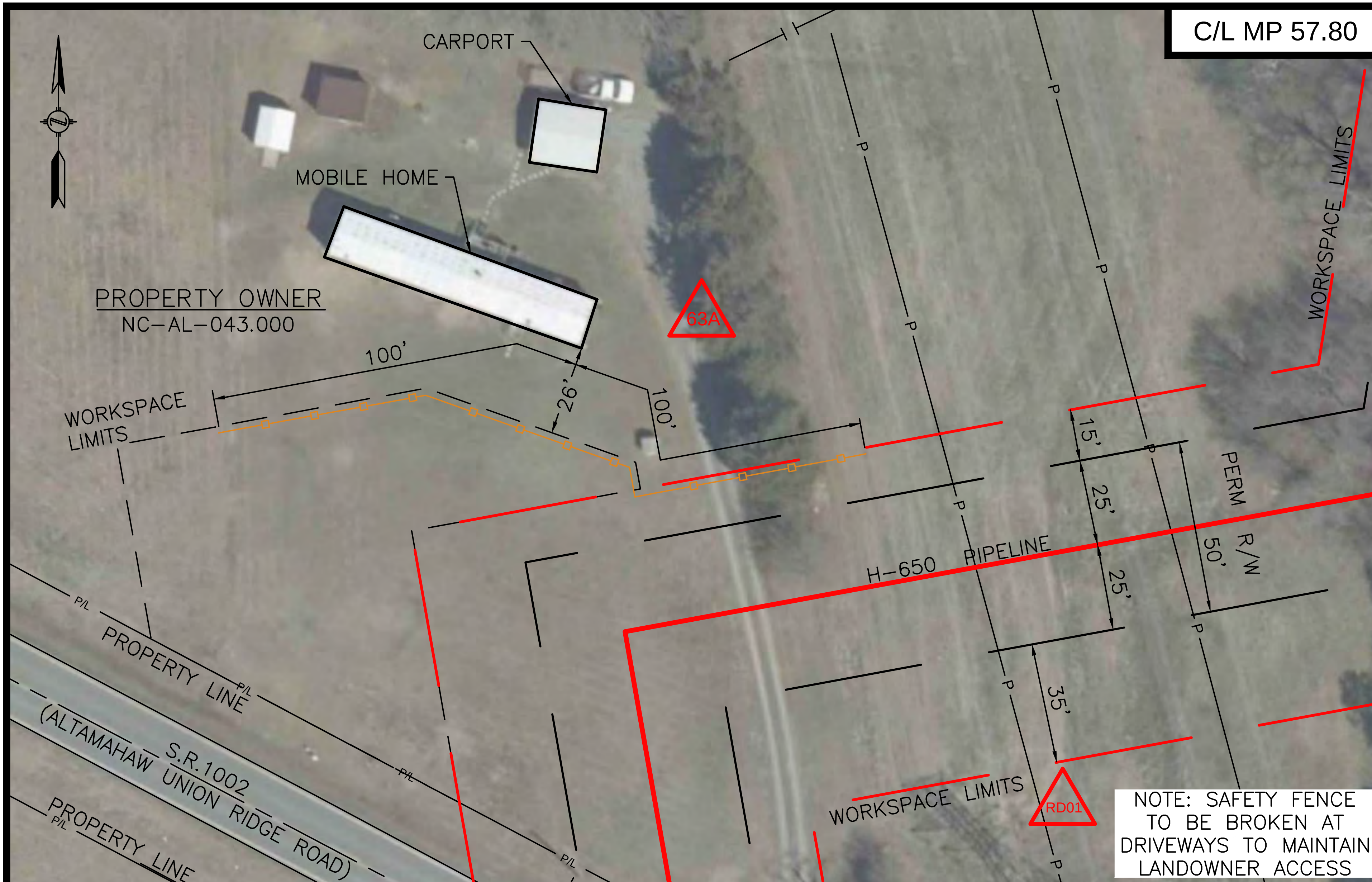
B.7-10



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

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DETAIL SHEET:		
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Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

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ENGINEERING CK:	.	.
DETAIL SHEET:		
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DATE OF PLOT: 6/17/2019 12:32 PM		

B.7-11

B.7-12

C/L MP 72.80

NOTE: SAFETY FENCE TO BE BROKEN AT DRIVEWAYS TO MAINTAIN LANDOWNER ACCESS

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: TBH	10/17/18
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ENVIRONMENTAL CK:	
ENGINEERING CK: .	.
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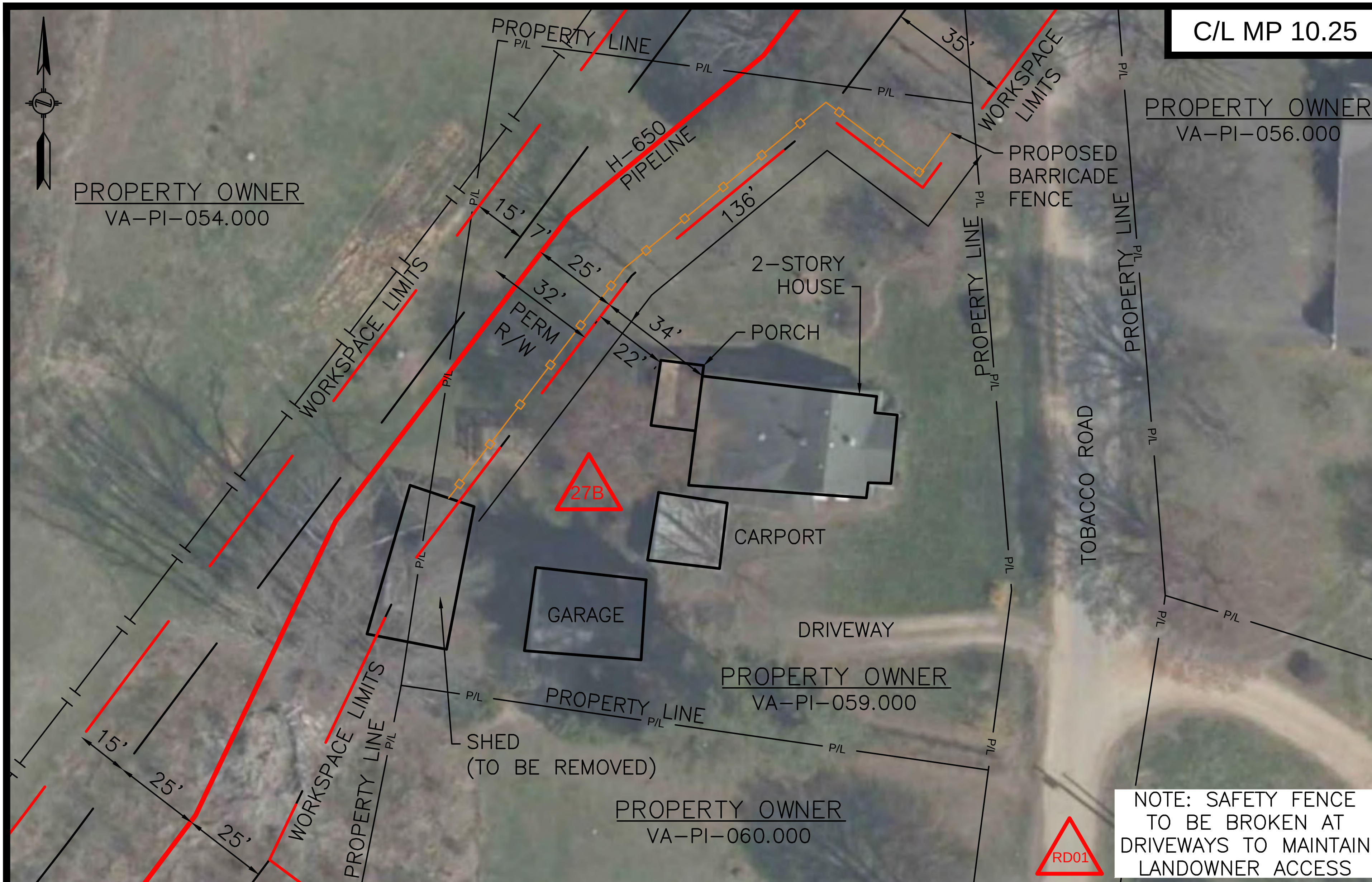
B.7-16



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY, VIRGINIA

SHEET 1 OF 1

DRAWN BY:	TBH	10/17/18
DRAFTING CK:	SJO	10/22/18
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ENGINEERING CK:	.	.
DETAIL SHEET:		
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DATE OF PLOT: 6/17/2019 12:32 PM		

B.7-14

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	TBH	10/17/18
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ENGINEERING CK:	.	.
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-017**	
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DATE OF PLOT: 6/17/2019 12:32 PM		

B.7-16

C/L MP 69.65

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: TBH	10/17/18
DRAFTING CK: SJO	10/22/18
ENVIRONMENTAL CK:	
ENGINEERING CK: .	.
DETAIL SHEET:	
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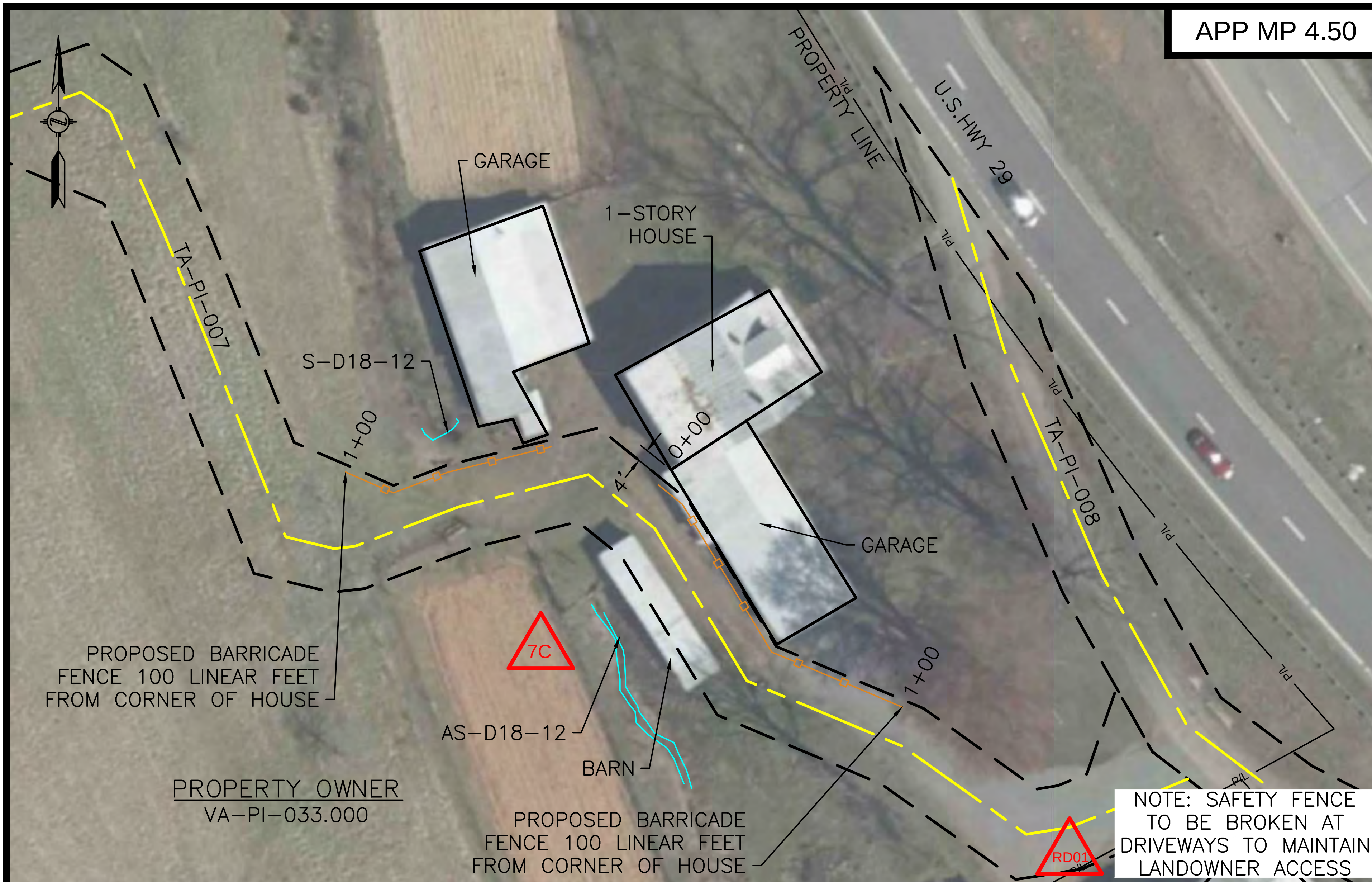
B.7-16

APP MP 4.50



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary
- Stream

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY,VIRGINIA

SHEET 1 OF 1

DRAWN BY:	SJS	03/19/19
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DETAIL SHEET:		
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B.7-1c

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: SJS	03/19/19
DRAFTING CK: DEM	03/20/19
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ENGINEERING CK: .	.
DETAIL SHEET:	
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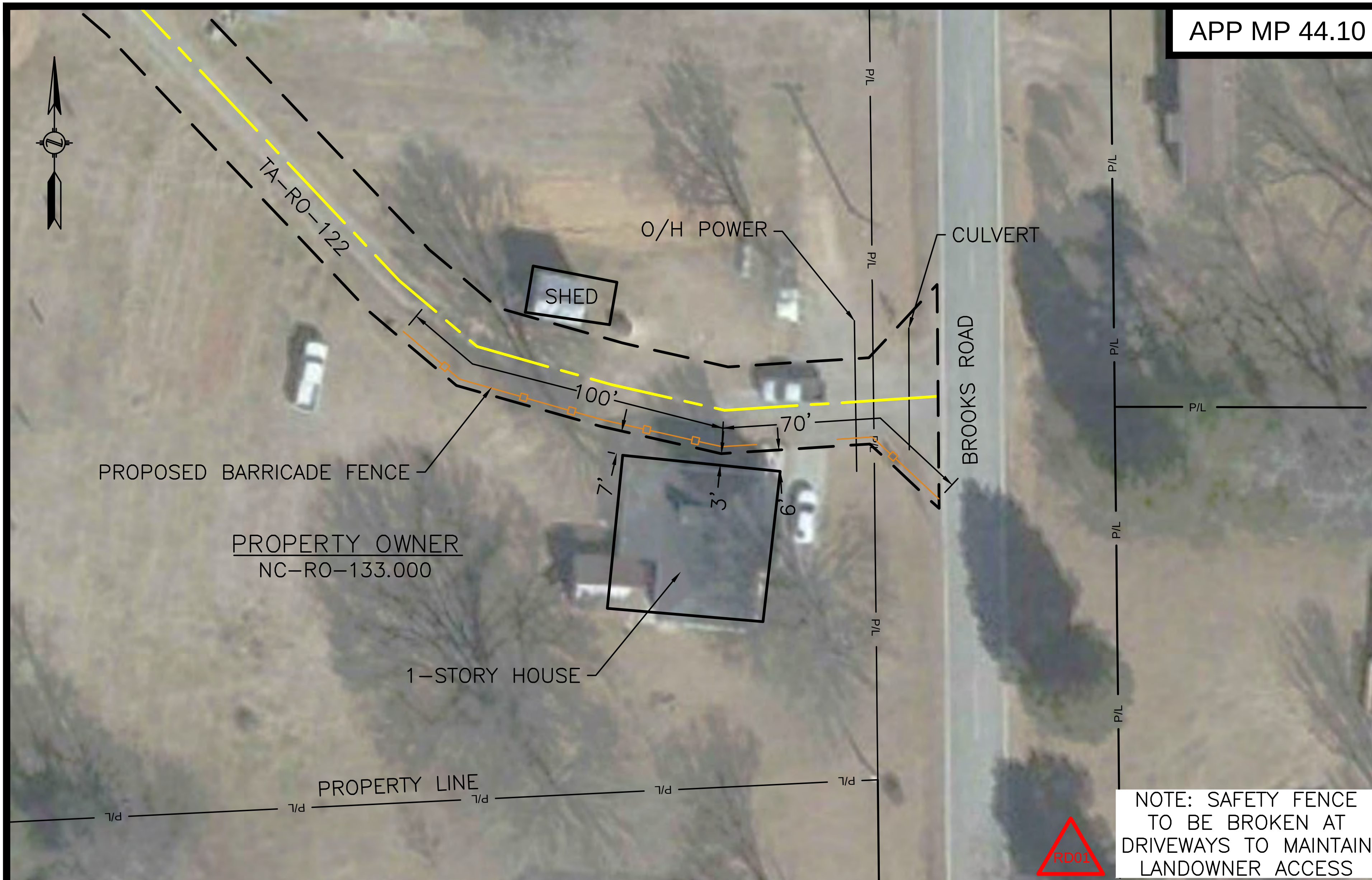
DATE OF PLOT: 6/17/2019 12:33 PM	

APP MP 44.10



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: SJS	03/19/19
DRAFTING CK: DEM	03/20/19
ENVIRONMENTAL CK:	
ENGINEERING CK: .	.
DETAIL SHEET:	
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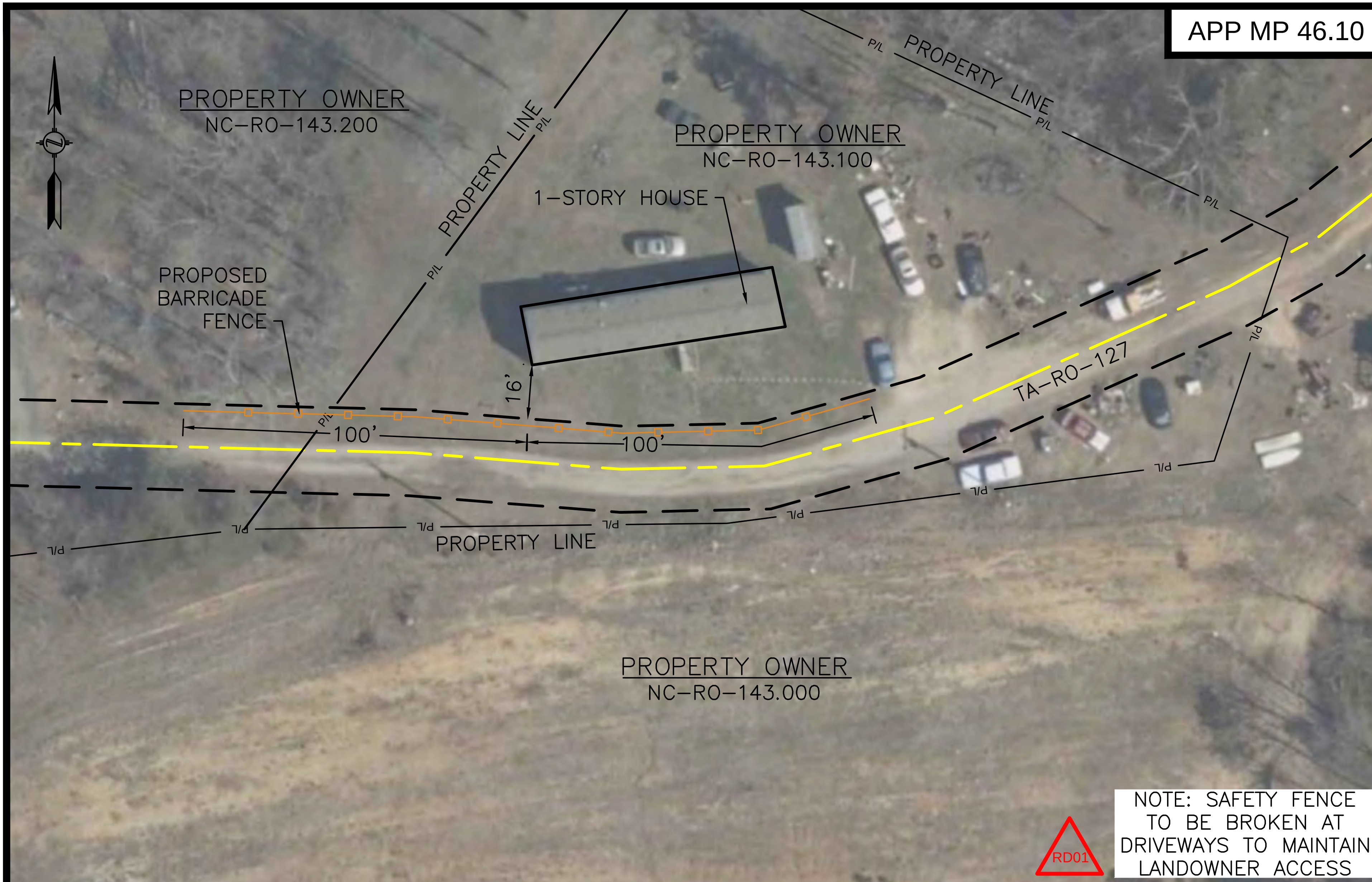
SCALE: 1" = 40'	REV. P1
DATE OF PLOT: 6/17/2019 12:34 PM	

B.7-18



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

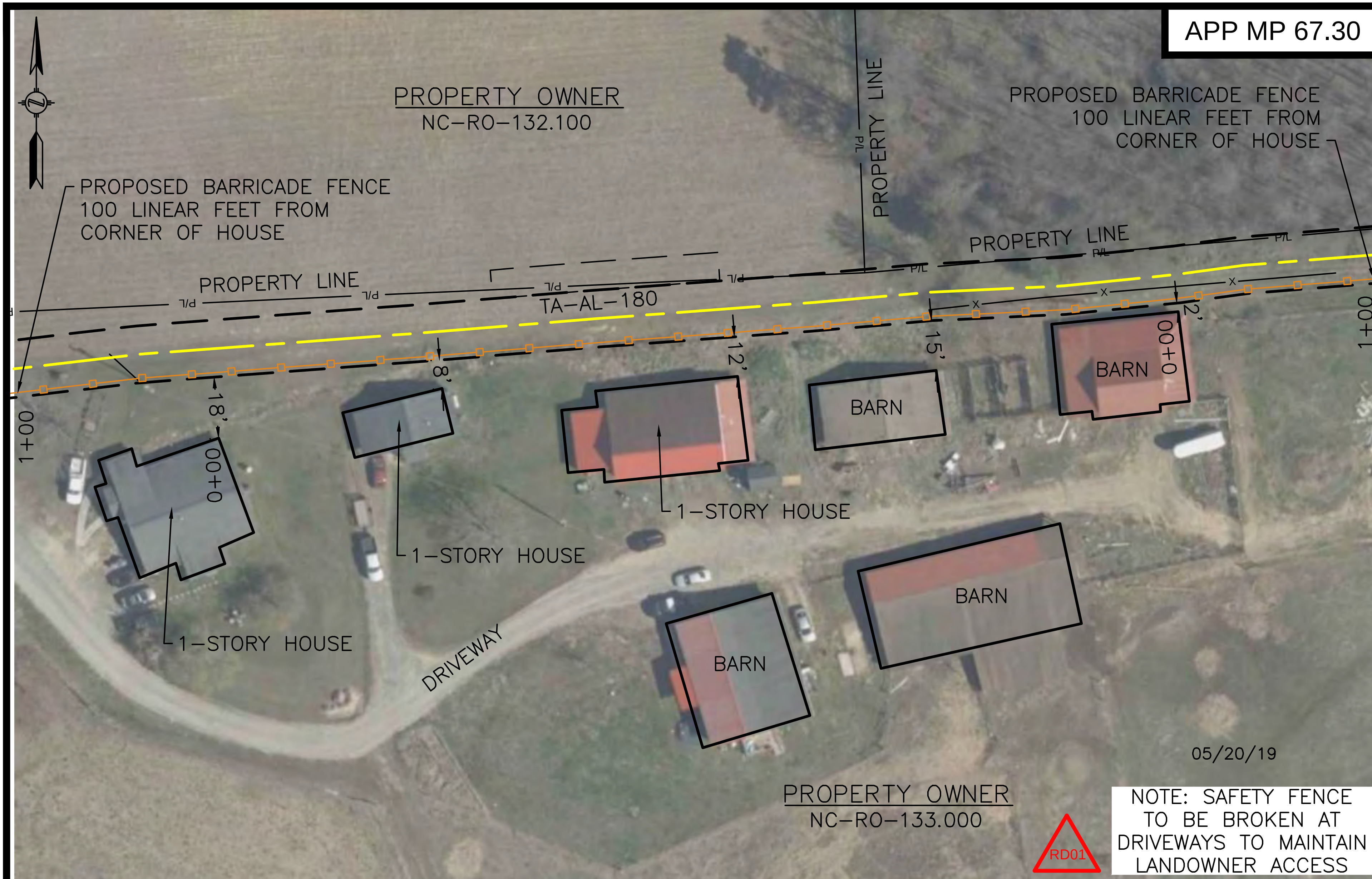
MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	SJS	03/19/19
DRAFTING CK:	DEM	03/20/19
ENVIRONMENTAL CK:		
ENGINEERING CK:	.	.
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-027**	
SCALE: 1" = 40'		REV. P1
DATE OF PLOT: 6/17/2019 12:34 PM		

B.7-10

B.7-20



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: TBH	10/17/18
DRAFTING CK: DEM	03/20/19
ENVIRONMENTAL CK:	
ENGINEERING CK: .	.
DETAIL SHEET:	
DRAWING NO.: **RSS-H650-028**	
SCALE: 1" = 40'	REV. P1
DATE OF PLOT: 6/17/2019 12:34 PM	

B.7-21

APP MP 16.7

NOTE: SAFETY FENCE TO BE BROKEN AT DRIVEWAYS TO MAINTAIN LANDOWNER ACCESS

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY, VIRGINIA

SHEET 1 OF 1

DRAWN BY: KMB	05/02/19
DRAFTING CK: SSL	05/03/19
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: RSS-H650-029	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 12:35 PM	

APP MP 30.0

NOTE: SAFETY FENCE TO BE BROKEN AT DRIVEWAYS TO MAINTAIN LANDOWNER ACCESS

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	KMB	05/02/19
DRAFTING CK:	SSL	05/03/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-030**	
SCALE: 1" = 40'		REV. P
DATE OF PLOT: 6/17/2019 12:35 PM		

B.7-23

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	KMB	05/03/19
DRAFTING CK:	SSL	05/07/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-031**	
SCALE: 1" = 40'		REV. P
DATE OF PLOT: 6/17/2019 12:35 PM		

B.7-24

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: KMB	05/06/19
DRAFTING CK: SSL	05/07/19
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: RSS-H650-032	
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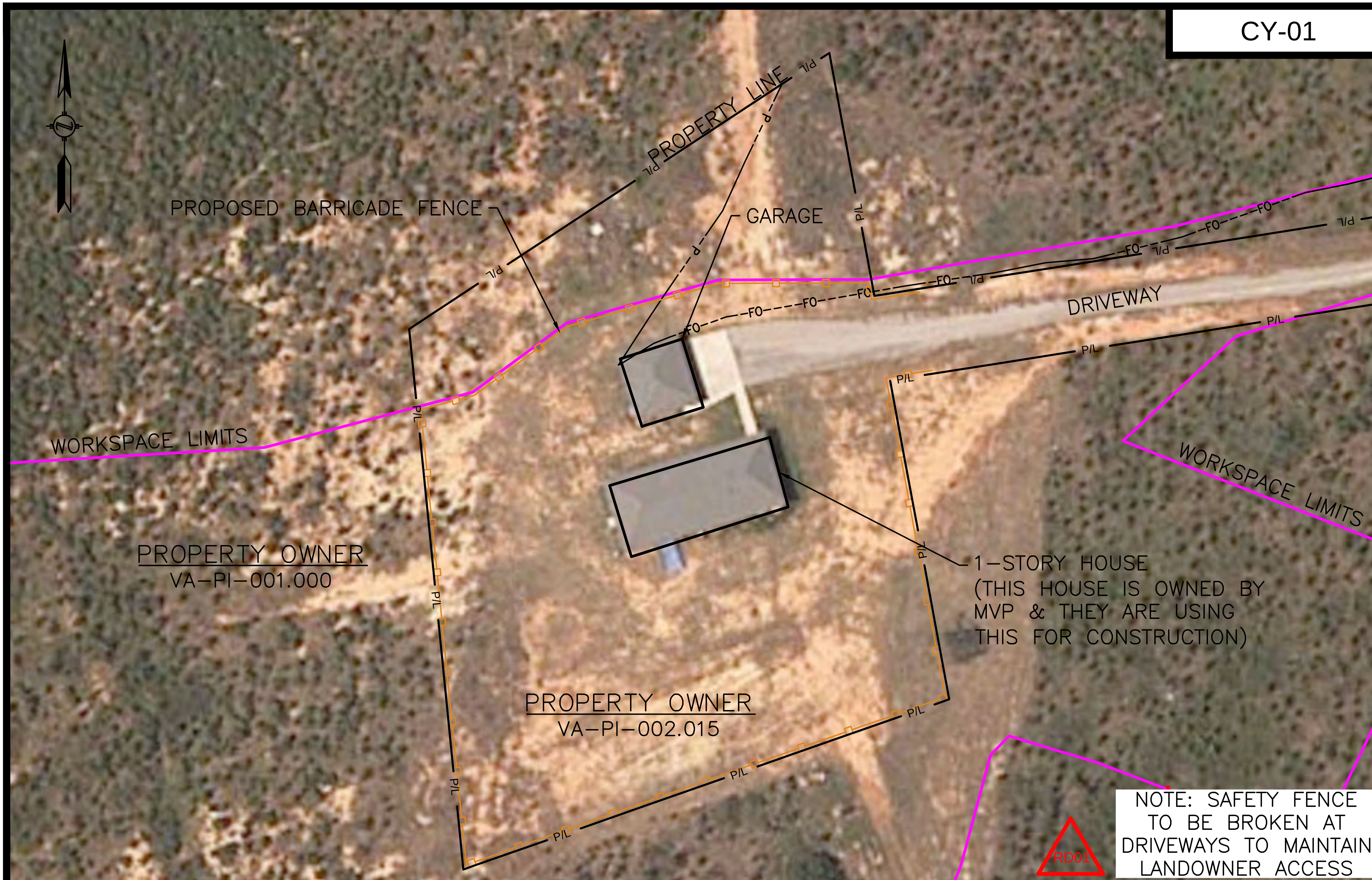

NOTE: SAFETY FENCE TO BE BROKEN AT DRIVEWAYS TO MAINTAIN LANDOWNER ACCESS

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY, VIRGINIA

SHEET 1 OF 1

DRAWN BY:	KMB	05/06/19
DRAFTING CK:	SSL	05/07/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-033**	
SCALE: 1" = 80'		REV. P
DATE OF PLOT: 6/17/2019 12:36 PM		

B.7-26

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: KMB		05/09/19
DRAFTING CK: SSL		05/09/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.: **RSS-H650-034**		
SCALE: 1" = 40'	REV. P	
DATE OF PLOT: 6/17/2019 12:36 PM		

B.7-27

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	KMB	05/09/19
DRAFTING CK:	SSL	05/09/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.: RSS-H650-035		
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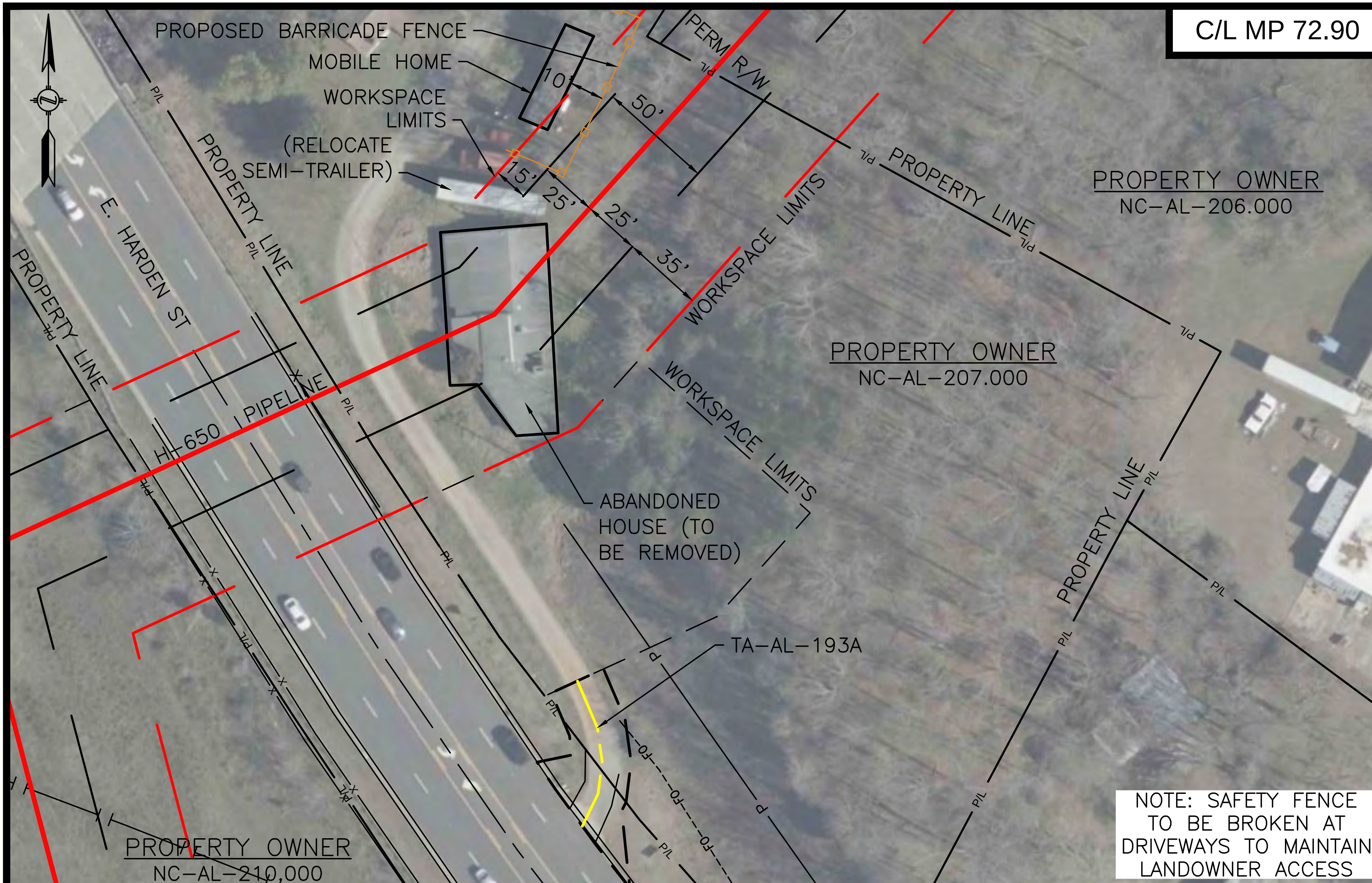


Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

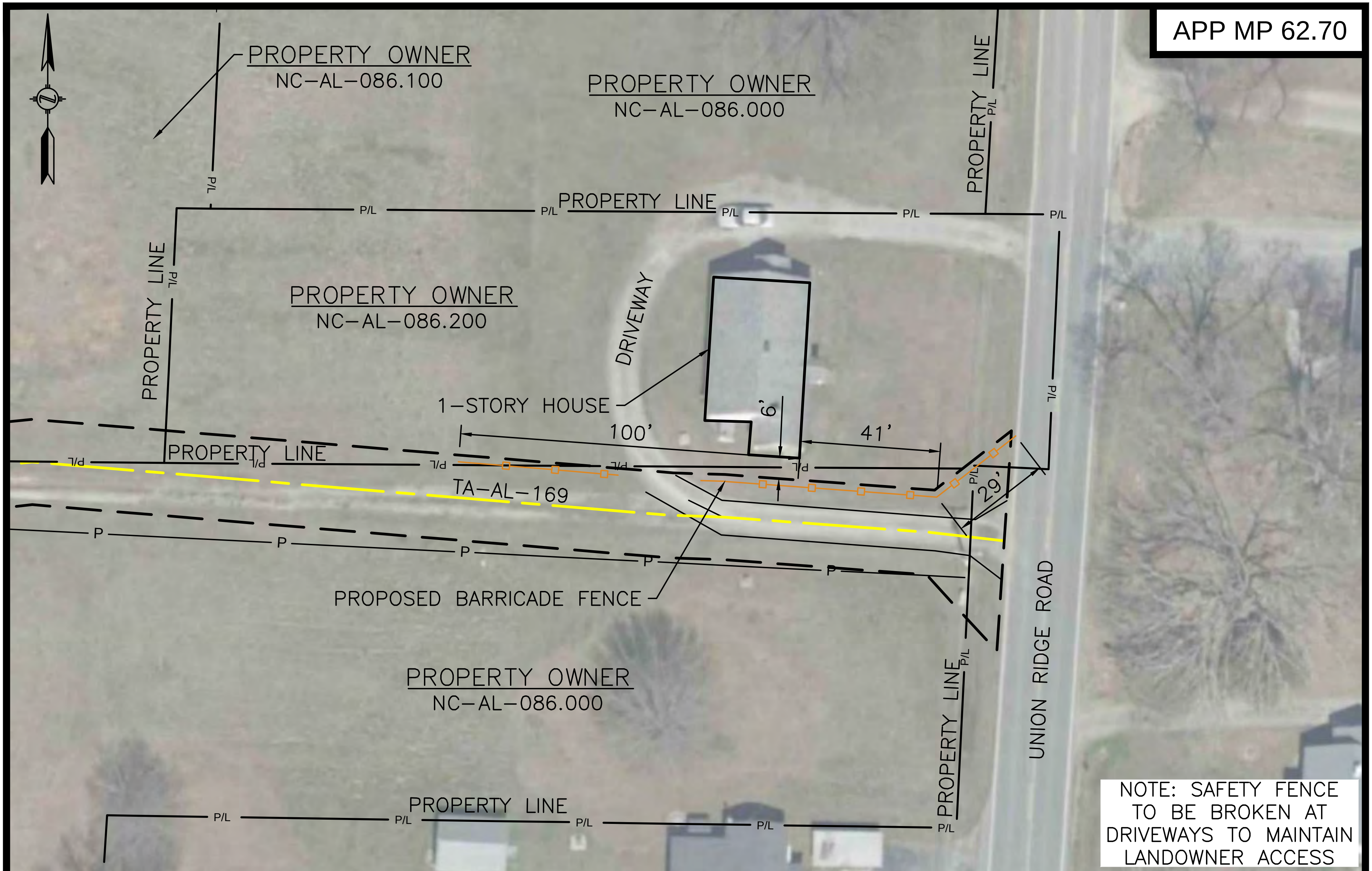
MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: KMB	05/15/19
DRAFTING CK: SSL	05/15/19
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: RSS-H650-036	
SCALE: 1" = 60'	REV. P
DATE OF PLOT: 6/17/2019 12:36 PM	

B.7-28

B.7-20



Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: KMB	05/15/19
DRAFTING CK:	
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: **RSS-H650-037**	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 12:37 PM	

B.7-30

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: KMB	05/15/19
DRAFTING CK:	
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: RSS-H650-038	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 12:37 PM	

B.7-31

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ROCKINGHAM COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY:	KMB	05/15/19
DRAFTING CK:	SSL	05/15/19
ENVIRONMENTAL CK:		
ENGINEERING CK:		
DETAIL SHEET:		
DRAWING NO.:	**RSS-H650-039**	
SCALE: 1" = 40'		REV. P
DATE OF PLOT: 6/17/2019 12:37 PM		

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: CCH	05/17/19
DRAFTING CK: SSL	05/17/19
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: **RSS-H650-040**	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 1:22 PM	

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
PITTSYLVANIA COUNTY, VIRGINIA

SHEET 1 OF 1

DRAWN BY: CCH	06/13/19
DRAFTING CK:	
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: **RSS-H650-041**	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 2:08 PM	

B.7-34

APP MP 58.60

NOTE: SAFETY FENCE TO BE BROKEN AT DRIVEWAYS TO MAINTAIN LANDOWNER ACCESS

Legend

- Pipeline Centerline
- Temporary Workspace
- Permanent ROW
- Barricade Fence
- Access Road
- Contractor Yard Boundary

Mountain Valley PIPELINE LLC

CONSTRUCTION DETAILS - RESIDENTIAL SITE SPECIFIC

MVP SOUTHGATE PROJECT
PROPOSED H-650 PIPELINE
ALAMANCE COUNTY, NORTH CAROLINA

SHEET 1 OF 1

DRAWN BY: CCH	06/13/19
DRAFTING CK:	
ENVIRONMENTAL CK:	
ENGINEERING CK:	
DETAIL SHEET:	
DRAWING NO.: **RSS-H650-042**	
SCALE: 1" = 40'	REV. P
DATE OF PLOT: 6/17/2019 2:08 PM	

APPENDIX B.8

Locations where Southgate Construction Workspace Parallel a Waterbody (or associated Wetland) within 15 feet

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Appendix B-8

Locations where Southgate Construction Workspace Parallel a Waterbody (or associated Wetland) within 15 feet

Resource ID	MP	Length Parallel to Resource (feet)	Justification
S-F18-17	9.9	60	Crossing location avoids sensitive resource site. Minimizes impact to wetlands. Constructability to avoid side slope construction
S-F18-28 / W-F18-29	11.4	37	Collocation and constructability to avoid side slope construction
S-D18-37	15.7	52 / 44	Collocation and constructability to avoid side slope construction
W-E18-43	18.0	76	Collocation and constructability to avoid side slope construction
S-E18-35	23.9	18	Collocation and constructability to avoid side slope construction
S-A18-36	28.4	53	Collocation and constructability to avoid side slope construction
S-A18-143	31.9	28	Collocation and constructability to avoid side slope construction
S-A18-150	32.5	40	Collocation and constructability to avoid side slope construction
S-A18-151	32.7	90	Constructability to avoid side slope construction
S-A18-154	33.0	38	Constructability to avoid side slope construction
S-A18-94 / W-A18-95	37.0	40 / 61	Constructability to avoid side slope construction
S-B19-158	37.6	78	Collocation and constructability to avoid side slope construction
S-A18-4	38.5	180	Collocation
W-B18-55	41.1	60	Collocation and constructability to avoid side slope construction
AS-B18-71	45.7	352, 39	Collocation and constructability to avoid side slope construction
W-A18-184	49.8	122	Collocation and constructability to avoid side slope construction
S-A18-87	53.7	43	Collocation
S-B18-59 / W-B18-60	55.3	102 / 63	Constructability, to avoid residences
S-A18-125 / W-A18-119	56.5	241 / 60	Collocation
S-A18-125 / W-A18-127	56.6	105 / 153	Collocation
S-C18-12	58.7	38	Collocation and constructability to avoid side slope construction
S-A18-70	62.4	50	Constructability to avoid side slope construction
S-B18-14	63.2	51	Collocation and constructability to avoid side slope construction
W-B19-161	65.5	81	Constructability, to avoid residences
S-B18-9	68.8	50	Constructability to avoid side slope construction
S-B18-135	70.2	110	Constructability to avoid side slope construction
S-C18-82	70.4	93	Constructability to avoid side slope construction
W-18-67	71.8	34	Collocation and constructability to avoid side slope construction

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APPENDIX C.1

Surficial Geology Crossed by the Southgate Project

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Appendix C.1

Surficial Geology Crossed by the Southgate Project

Project Facilities	County	Start MP	End MP	Surficial Geology Material
Pipeline Facilities				
Virginia				
H-605	Pittsylvania	0	0.1	Residual materials developed in sedimentary rocks, discontinuous
		0.1	0.5	Residual materials developed in bedrock, discontinuous
H-650	Pittsylvania	0	0.4	Residual materials developed in bedrock, discontinuous
		0.4	2	Residual materials developed in sedimentary rocks, discontinuous
		2	15.2	Residual materials developed in igneous and metamorphic rocks
		15.2	26.1	Residual materials developed in bedrock, discontinuous
North Carolina				
H-650	Rockingham	26.1	52.6	Residual materials developed in bedrock, discontinuous
H-650	Alamance	52.6	73.2	Residual materials developed in igneous and metamorphic rocks
Aboveground Facilities		**Area (acres)**	**Near MP**	
Lambert CS / Interconnect / MLV 1	Pittsylvania	3.2	0	Residual materials developed in bedrock, discontinuous
MLV 2		<0.1	7.4	Residual materials developed in igneous and metamorphic rocks
MLV 3		<0.1	18.3	Residual materials developed in bedrock, discontinuous
LN 3600 Interconnect	Rockingham	0.7	28.2	Residual materials developed in bedrock, discontinuous
T-15 Dan River Interconnect / MLV4		0.7	30.4	Residual materials developed in bedrock, discontinuous
MLV 5		<0.1	42.2	Residual materials developed in igneous and metamorphic rocks
MLV 6	Alamance	<0.1	55.1	Residual materials developed in igneous and metamorphic rocks
MLV 7		<0.1	68.2	Residual materials developed in igneous and metamorphic rocks
T-21 Haw River Interconnect / MLV 8		0.7	73.1	Residual materials developed in igneous and metamorphic rocks

Source: Soller and Reheis, 2004

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APPENDIX C.2

Bedrock Geology Underlying the Southgate Project

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Appendix C.2

Bedrock Geology Underlying the Southgate Project

Project Facilities	From Milepost	To Milepost	Crossing Length (Miles)	Formation	Primary Rock	Secondary Rock	Map Symbol
Pipeline Facilities							
H-605	0.00	0.024	0.24	Upper Triassic	sandstone	siltstone	TRss
	0.24	0.36	0.12	Upper Triassic	conglomerate		TRc
	0.36	0.44	0.07	Upper Triassic	sandstone	siltstone	TRss
H-650	0.00	0.39	0.39	Upper Triassic	sandstone	siltstone	TRss
	0.39	0.95	0.56	Upper Triassic	conglomerate		TRc
	0.95	1.20	0.25	Proterozoic Z-Cambrian	mica schist	gneiss	Zfm
	1.20	1.86	0.66	Cambrian	granite		lw
	1.86	14.95	13.09	Proterozoic Z-Cambrian	mica schist	gneiss	Zfm
	14.95	16.19	1.24	Upper Triassic	conglomerate		TRc
	16.19	17.13	0.94	Upper Triassic	sandstone		TRs
	17.13	18.03	0.91	Upper Triassic	sandstone	siltstone	TRss
	18.03	18.70	0.67	Upper Triassic	conglomerate		TRc
	18.70	20.62	1.92	Proterozoic Z	biotite gneiss	amphibolite	Zau
	20.62	21.07	0.45	Proterozoic Z-Cambrian	mica schist	amphibolite	Zab
	21.07	22.35	1.28	Proterozoic - Paleozoic	mylonite	gneiss	my
	22.35	24.57	2.22	Upper Triassic	sandstone	siltstone	TRss
	24.57	26.11	1.54	Triassic	sandstone	siltstone	TRcs
	26.11	28.99	2.88	Triassic	sandstone	mudstone	TRdp
	28.99	29.41	0.42	Triassic	mudstone	sandstone	TRdc
	29.41	31.11	1.70	Triassic	sandstone	mudstone	TRdp
	31.11	32.65	1.54	Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
	32.65	32.95	0.30	Cambrian/Late Proterozoic	felsic gneiss	mafic gneiss	CZfg
	32.95	34.12	1.17	Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
	34.12	34.93	0.82	Cambrian/Late Proterozoic	felsic gneiss	mafic gneiss	CZfg
	34.93	39.31	4.38	Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
	39.31	41.28	1.96	Cambrian/Late Proterozoic	felsic gneiss	mafic gneiss	CZfg
	41.28	46.15	4.87	Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
	46.15	47.56	1.41	Permian/Pennsylvanian	granite		PPg

Appendix C.2

Bedrock Geology Underlying the Southgate Project

Project Facilities	From Milepost	To Milepost	Crossing Length (Miles)	Formation	Primary Rock	Secondary Rock	Map Symbol
	47.56	48.35	0.80	Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
	48.35	49.29	0.94	Permian/Pennsylvanian	granite		PPg
	49.29	50.56	1.27	Cambrian/Late Proterozoic	mafic metavolcanic rock	felsic metavolcanic rock	CZmv
	50.56	50.63	0.06	Cambrian/Late Proterozoic	phyllite	schist	CZph
	50.63	54.77	4.15	Cambrian/Late Proterozoic	mafic metavolcanic rock	felsic metavolcanic rock	CZmv
	54.77	55.22	0.45	Cambrian/Late Proterozoic	felsic metavolcanic rock	mafic metavolcanic rock	CZfv
	55.22	58.32	3.10	Cambrian/Late Proterozoic	metamorphic rock		CZg
	58.32	59.14	0.82	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	59.14	59.48	0.35	Cambrian/Late Proterozoic	metamorphic rock		CZg
	59.48	59.63	0.14	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	59.63	60.55	0.92	Cambrian/Late Proterozoic	metamorphic rock		CZg
	60.55	61.32	0.77	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	61.32	61.54	0.22	Cambrian/Late Proterozoic	metamorphic rock		CZg
	61.54	61.59	0.05	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	61.59	61.86	0.27	Cambrian/Late Proterozoic	metamorphic rock		CZg
	61.86	62.37	0.51	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	62.37	63.03	0.66	Cambrian/Late Proterozoic	metamorphic rock		CZg
	63.03	64.52	1.49	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
	64.52	69.40	4.88	Cambrian/Late Proterozoic	metamorphic rock		CZg
	69.40	72.92	3.52	Cambrian/Late Proterozoic	mafic metavolcanic rock	felsic metavolcanic rock	CZmv
	72.92	73.11	0.19	Paleozoic/Late Proterozoic	metamorphic rock		PzZg
Aboveground Facilities							
	Area (acres)	**Nearest Mile Post**					
Lambert Compressor Station/ Interconnect/ MLV 1	3.17	0		Upper Triassic	sandstone	siltstone	TRss
MLV 2	0.02	7.4		Proterozoic Z-Cambrian	mica schist	gneiss	Zfm
MLV 3	0.02	18.3		Upper Triassic	conglomerate		TRc
LN 3600 Interconnect	0.66	28.2		Triassic	sandstone	mudstone	TRdp

Appendix C.2

Bedrock Geology Underlying the Southgate Project

Project Facilities	From Milepost	To Milepost	Crossing Length (Miles)	Formation	Primary Rock	Secondary Rock	Map Symbol
T-15 Dan River Interconnect/ MLV 4	0.68	30.4		Triassic	sandstone	mudstone	TRdp
MLV 5	0.02	42.2		Cambrian/Late Proterozoic	biotite gneiss	mica schist	CZbg
MLV 6	0.02	55.1		Cambrian/Late Proterozoic	felsic metavolcanic rock	mafic metavolcanic rock	CZfv
MLV 7	0.02	68.2		Cambrian/Late Proterozoic	metamorphic rock		CZg
T-21 Haw River Interconnect/MLV8	0.66	73.1		Paleozoic/Late Proterozoic	metamorphic rock		PzZg

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APPENDIX C.3

Potential Areas of Steep Slopes and Side Slopes Crossed by the Southgate Project

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Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Lateral (H-605 Pipeline)	30 to 50	0.12 RR	0.13 RR	25
Southgate Mainline (H-650 Pipeline)	30 to 50	3.94 RR	3.94 RR	26
Southgate Mainline (H-650 Pipeline)	30 to 50	4.12	4.12	27
Southgate Mainline (H-650 Pipeline)	30 to 50	4.84	4.85	25
Southgate Mainline (H-650 Pipeline)	50 to 66	5.11	5.12	21
Southgate Mainline (H-650 Pipeline)	50 to 66	5.24	5.25	28
Southgate Mainline (H-650 Pipeline)	30 to 50	5.25	5.25	28
Southgate Mainline (H-650 Pipeline)	30 to 50	5.65	5.66	24
Southgate Mainline (H-650 Pipeline)	50 to 66	6.99	6.99	29
Southgate Mainline (H-650 Pipeline)	30 to 50	7.60	7.61	25
Southgate Mainline (H-650 Pipeline)	30 to 50	7.98	7.99	75
Southgate Mainline (H-650 Pipeline)	30 to 50	8.58	8.58	29
Southgate Mainline (H-650 Pipeline)	50 to 66	8.58	8.59	29
Southgate Mainline (H-650 Pipeline)	30 to 50	8.59	8.59	34
Southgate Mainline (H-650 Pipeline)	66 to 80	9.95	9.95	30
Southgate Mainline (H-650 Pipeline)	50 to 66	9.95	9.96	24
Southgate Mainline (H-650 Pipeline)	30 to 50	9.96	9.96	18
Southgate Mainline (H-650 Pipeline)	30 to 50	10.08	10.09	44
Southgate Mainline (H-650 Pipeline)	30 to 50	10.29	10.30	25
Southgate Mainline (H-650 Pipeline)	30 to 50	11.04	11.06	76
Southgate Mainline (H-650 Pipeline)	50 to 66	11.83	11.84	24
Southgate Mainline (H-650 Pipeline)	30 to 50	12.78	12.79	52
Southgate Mainline (H-650 Pipeline)	66 to 80	13.46	13.47	35
Southgate Mainline (H-650 Pipeline)	30 to 50	13.47	13.48	33
Southgate Mainline (H-650 Pipeline)	30 to 50	17.27	17.28	51
Southgate Mainline (H-650 Pipeline)	50 to 66	17.29	17.30	31
Southgate Mainline (H-650 Pipeline)	30 to 50	17.30	17.31	49
Southgate Mainline (H-650 Pipeline)	30 to 50	17.76	17.76	26
Southgate Mainline (H-650 Pipeline)	30 to 50	17.92	17.93	50
Southgate Mainline (H-650 Pipeline)	30 to 50	18.01	18.02	94
Southgate Mainline (H-650 Pipeline)	30 to 50	20.39	20.41	118
Southgate Mainline (H-650 Pipeline)	30 to 50	20.63	20.64	72
Southgate Mainline (H-650 Pipeline)	30 to 50	21.52	21.54	73
Southgate Mainline (H-650 Pipeline)	30 to 50	21.54	21.55	42
Southgate Mainline (H-650 Pipeline)	30 to 50	22.00	22.01	27
Southgate Mainline (H-650 Pipeline)	30 to 50	22.35	22.36	32
Southgate Mainline (H-650 Pipeline)	30 to 50	22.81	22.83	133
Southgate Mainline (H-650 Pipeline)	30 to 50	22.84	22.85	39
Southgate Mainline (H-650 Pipeline)	30 to 50	23.23	23.24	72
Southgate Mainline (H-650 Pipeline)	30 to 50	23.30	23.30	36
Southgate Mainline (H-650 Pipeline)	30 to 50	24.37	24.37	31
Southgate Mainline (H-650 Pipeline)	30 to 50	24.78	24.79	77
Southgate Mainline (H-650 Pipeline)	30 to 50	24.99	25.00	56

Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	25.16	25.17	45
Southgate Mainline (H-650 Pipeline)	30 to 50	26.19	26.20	21
Southgate Mainline (H-650 Pipeline)	30 to 50	27.49	27.50	22
Southgate Mainline (H-650 Pipeline)	66 to 80	27.52	27.52	16
Southgate Mainline (H-650 Pipeline)	30 to 50	27.52	27.52	10
Southgate Mainline (H-650 Pipeline)	30 to 50	28.82	28.85	142
Southgate Mainline (H-650 Pipeline)	30 to 50	28.95	28.96	63
Southgate Mainline (H-650 Pipeline)	30 to 50	29.28 RR	29.28 RR	39
Southgate Mainline (H-650 Pipeline)	30 to 50	29.34 RR	29.36 RR	124
Southgate Mainline (H-650 Pipeline)	30 to 50	29.41 RR	29.43 RR	133
Southgate Mainline (H-650 Pipeline)	30 to 50	29.52 RR	29.53 RR	23
Southgate Mainline (H-650 Pipeline)	50 to 66	29.53 RR	29.53 RR	9
Southgate Mainline (H-650 Pipeline)	50 to 66	30.05	30.06	31
Southgate Mainline (H-650 Pipeline)	30 to 50	31.06	31.06	22
Southgate Mainline (H-650 Pipeline)	30 to 50	31.06	31.07	36
Southgate Mainline (H-650 Pipeline)	30 to 50	31.09	31.12	139
Southgate Mainline (H-650 Pipeline)	30 to 50	31.28	31.29	68
Southgate Mainline (H-650 Pipeline)	30 to 50	31.30	31.31	57
Southgate Mainline (H-650 Pipeline)	30 to 50	31.31	31.32	31
Southgate Mainline (H-650 Pipeline)	30 to 50	31.67	31.68	97
Southgate Mainline (H-650 Pipeline)	30 to 50	31.70	31.70	34
Southgate Mainline (H-650 Pipeline)	30 to 50	31.72	31.73	66
Southgate Mainline (H-650 Pipeline)	30 to 50	31.86	31.87	51
Southgate Mainline (H-650 Pipeline)	30 to 50	31.87	31.88	40
Southgate Mainline (H-650 Pipeline)	66 to 80	31.88	31.89	54
Southgate Mainline (H-650 Pipeline)	30 to 50	31.89	31.89	10
Southgate Mainline (H-650 Pipeline)	66 to 80	31.93	31.93	29
Southgate Mainline (H-650 Pipeline)	50 to 66	31.93	31.94	32
Southgate Mainline (H-650 Pipeline)	50 to 66	32.02	32.03	28
Southgate Mainline (H-650 Pipeline)	30 to 50	32.04	32.04	40
Southgate Mainline (H-650 Pipeline)	30 to 50	32.27	32.27	31
Southgate Mainline (H-650 Pipeline)	30 to 50	32.46	32.47	60
Southgate Mainline (H-650 Pipeline)	30 to 50	32.47	32.48	26
Southgate Mainline (H-650 Pipeline)	30 to 50	32.50	32.52	80
Southgate Mainline (H-650 Pipeline)	30 to 50	32.55	32.56	40
Southgate Mainline (H-650 Pipeline)	50 to 66	32.56	32.57	20
Southgate Mainline (H-650 Pipeline)	30 to 50	32.57	32.57	36
Southgate Mainline (H-650 Pipeline)	30 to 50	32.59	32.60	92
Southgate Mainline (H-650 Pipeline)	30 to 50	32.66	32.67	26
Southgate Mainline (H-650 Pipeline)	30 to 50	32.75	32.76	25
Southgate Mainline (H-650 Pipeline)	30 to 50	33.12	33.13	40
Southgate Mainline (H-650 Pipeline)	66 to 80	33.13	33.14	75
Southgate Mainline (H-650 Pipeline)	30 to 50	33.14	33.15	21

Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	33.16	33.17	34
Southgate Mainline (H-650 Pipeline)	30 to 50	33.25	33.26	23
Southgate Mainline (H-650 Pipeline)	30 to 50	33.27	33.28	30
Southgate Mainline (H-650 Pipeline)	30 to 50	33.30	33.32	64
Southgate Mainline (H-650 Pipeline)	30 to 50	33.33	33.34	89
Southgate Mainline (H-650 Pipeline)	30 to 50	33.38	33.39	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.68	33.69	56
Southgate Mainline (H-650 Pipeline)	30 to 50	33.70	33.70	41
Southgate Mainline (H-650 Pipeline)	50 to 66	33.73	33.73	23
Southgate Mainline (H-650 Pipeline)	50 to 66	33.74	33.75	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.75	33.77	103
Southgate Mainline (H-650 Pipeline)	30 to 50	33.79	33.80	28
Southgate Mainline (H-650 Pipeline)	30 to 50	33.81	33.82	42
Southgate Mainline (H-650 Pipeline)	30 to 50	33.82	33.83	47
Southgate Mainline (H-650 Pipeline)	30 to 50	33.88	33.89	52
Southgate Mainline (H-650 Pipeline)	30 to 50	33.92	33.94	94
Southgate Mainline (H-650 Pipeline)	30 to 50	33.99	34.00	23
Southgate Mainline (H-650 Pipeline)	30 to 50	34.15	34.16	23
Southgate Mainline (H-650 Pipeline)	50 to 66	34.21 RR	34.21 RR	4
Southgate Mainline (H-650 Pipeline)	> 80+	34.21 RR	34.22 RR	8
Southgate Mainline (H-650 Pipeline)	50 to 66	34.22 RR	34.22 RR	4
Southgate Mainline (H-650 Pipeline)	30 to 50	34.22 RR	34.23 RR	60
Southgate Mainline (H-650 Pipeline)	30 to 50	34.29	34.30	42
Southgate Mainline (H-650 Pipeline)	50 to 66	34.30	34.31	42
Southgate Mainline (H-650 Pipeline)	30 to 50	34.51	34.52	21
Southgate Mainline (H-650 Pipeline)	30 to 50	34.52	34.53	50
Southgate Mainline (H-650 Pipeline)	30 to 50	34.55	34.56	20
Southgate Mainline (H-650 Pipeline)	30 to 50	34.59	34.60	27
Southgate Mainline (H-650 Pipeline)	30 to 50	34.85	34.86	52
Southgate Mainline (H-650 Pipeline)	30 to 50	35.07	35.08	21
Southgate Mainline (H-650 Pipeline)	30 to 50	35.14	35.14	31
Southgate Mainline (H-650 Pipeline)	30 to 50	35.36	35.36	24
Southgate Mainline (H-650 Pipeline)	30 to 50	35.57	35.57	20
Southgate Mainline (H-650 Pipeline)	30 to 50	35.92	35.93	25
Southgate Mainline (H-650 Pipeline)	66 to 80	35.98	35.99	54
Southgate Mainline (H-650 Pipeline)	30 to 50	37.01	37.02	21
Southgate Mainline (H-650 Pipeline)	30 to 50	37.03	37.05	94
Southgate Mainline (H-650 Pipeline)	30 to 50	37.16	37.16	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.18	37.19	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.27	37.28	43
Southgate Mainline (H-650 Pipeline)	30 to 50	37.29	37.29	22
Southgate Mainline (H-650 Pipeline)	30 to 50	37.30	37.30	29
Southgate Mainline (H-650 Pipeline)	30 to 50	37.35	37.36	38

Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	37.58	37.59	24
Southgate Mainline (H-650 Pipeline)	30 to 50	37.72	37.72	31
Southgate Mainline (H-650 Pipeline)	30 to 50	38.24	38.25	23
Southgate Mainline (H-650 Pipeline)	66 to 80	38.54	38.55	76
Southgate Mainline (H-650 Pipeline)	30 to 50	38.60	38.61	28
Southgate Mainline (H-650 Pipeline)	30 to 50	38.76	38.76	35
Southgate Mainline (H-650 Pipeline)	30 to 50	38.78	38.80	93
Southgate Mainline (H-650 Pipeline)	30 to 50	39.03	39.04	39
Southgate Mainline (H-650 Pipeline)	30 to 50	39.05	39.06	45
Southgate Mainline (H-650 Pipeline)	30 to 50	39.06	39.07	24
Southgate Mainline (H-650 Pipeline)	30 to 50	39.10	39.10	28
Southgate Mainline (H-650 Pipeline)	50 to 66	39.67	39.68	26
Southgate Mainline (H-650 Pipeline)	50 to 66	39.69	39.70	27
Southgate Mainline (H-650 Pipeline)	30 to 50	40.54	40.55	44
Southgate Mainline (H-650 Pipeline)	30 to 50	40.56	40.56	36
Southgate Mainline (H-650 Pipeline)	66 to 80	40.57	40.57	24
Southgate Mainline (H-650 Pipeline)	30 to 50	40.64	40.64	25
Southgate Mainline (H-650 Pipeline)	30 to 50	40.74	40.74	23
Southgate Mainline (H-650 Pipeline)	30 to 50	40.75	40.75	41
Southgate Mainline (H-650 Pipeline)	30 to 50	40.88	40.89	40
Southgate Mainline (H-650 Pipeline)	30 to 50	41.11	41.11	39
Southgate Mainline (H-650 Pipeline)	30 to 50	41.56	41.57	23
Southgate Mainline (H-650 Pipeline)	30 to 50	41.57	41.58	25
Southgate Mainline (H-650 Pipeline)	50 to 66	41.67	41.67	20
Southgate Mainline (H-650 Pipeline)	30 to 50	41.67	41.68	32
Southgate Mainline (H-650 Pipeline)	30 to 50	42.25	42.26	44
Southgate Mainline (H-650 Pipeline)	30 to 50	43.69	43.69	28
Southgate Mainline (H-650 Pipeline)	30 to 50	43.70	43.71	31
Southgate Mainline (H-650 Pipeline)	30 to 50	43.81	43.82	23
Southgate Mainline (H-650 Pipeline)	30 to 50	43.93	43.93	36
Southgate Mainline (H-650 Pipeline)	50 to 66	43.98	43.99	53
Southgate Mainline (H-650 Pipeline)	30 to 50	44.02	44.03	32
Southgate Mainline (H-650 Pipeline)	50 to 66	44.03	44.03	24
Southgate Mainline (H-650 Pipeline)	30 to 50	44.03	44.03	9
Southgate Mainline (H-650 Pipeline)	50 to 66	44.06	44.06	20
Southgate Mainline (H-650 Pipeline)	30 to 50	44.14	44.14	26
Southgate Mainline (H-650 Pipeline)	30 to 50	44.15	44.19	169
Southgate Mainline (H-650 Pipeline)	30 to 50	44.56	44.57	22
Southgate Mainline (H-650 Pipeline)	30 to 50	45.72	45.73	45
Southgate Mainline (H-650 Pipeline)	30 to 50	45.83	45.85	134
Southgate Mainline (H-650 Pipeline)	30 to 50	46.48	46.49	37
Southgate Mainline (H-650 Pipeline)	50 to 66	46.50	46.50	39
Southgate Mainline (H-650 Pipeline)	30 to 50	46.53	46.54	29

Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	46.89	46.91	78
Southgate Mainline (H-650 Pipeline)	50 to 66	47.01	47.02	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.35	47.36	27
Southgate Mainline (H-650 Pipeline)	30 to 50	47.37	47.39	142
Southgate Mainline (H-650 Pipeline)	30 to 50	47.42	47.44	125
Southgate Mainline (H-650 Pipeline)	50 to 66	47.44	47.45	39
Southgate Mainline (H-650 Pipeline)	30 to 50	47.45	47.46	36
Southgate Mainline (H-650 Pipeline)	30 to 50	47.46	47.47	50
Southgate Mainline (H-650 Pipeline)	30 to 50	47.54	47.56	107
Southgate Mainline (H-650 Pipeline)	30 to 50	47.57	47.57	31
Southgate Mainline (H-650 Pipeline)	30 to 50	47.58	47.59	83
Southgate Mainline (H-650 Pipeline)	30 to 50	47.60	47.61	55
Southgate Mainline (H-650 Pipeline)	30 to 50	47.61	47.62	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.65	47.66	33
Southgate Mainline (H-650 Pipeline)	30 to 50	47.66	47.66	23
Southgate Mainline (H-650 Pipeline)	30 to 50	47.67	47.67	23
Southgate Mainline (H-650 Pipeline)	30 to 50	47.67	47.68	26
Southgate Mainline (H-650 Pipeline)	30 to 50	47.76	47.77	58
Southgate Mainline (H-650 Pipeline)	30 to 50	47.78	47.79	55
Southgate Mainline (H-650 Pipeline)	30 to 50	51.50	51.50	28
Southgate Mainline (H-650 Pipeline)	30 to 50	58.91	58.91	31
Southgate Mainline (H-650 Pipeline)	30 to 50	63.58	63.58	40
Southgate Mainline (H-650 Pipeline)	30 to 50	63.65	63.65	24
Southgate Mainline (H-650 Pipeline)	30 to 50	64.03	64.04	56
Southgate Mainline (H-650 Pipeline)	30 to 50	64.47	64.48	20
Southgate Mainline (H-650 Pipeline)	30 to 50	68.74	68.74	20
Southgate Mainline (H-650 Pipeline)	30 to 50	68.79	68.80	20
Southgate Mainline (H-650 Pipeline)	30 to 50	69.10	69.11	60
Southgate Mainline (H-650 Pipeline)	30 to 50	69.37	69.38	23
Southgate Mainline (H-650 Pipeline)	30 to 50	69.39	69.40	30
Southgate Mainline (H-650 Pipeline)	30 to 50	69.62	69.62	22
Southgate Mainline (H-650 Pipeline)	30 to 50	69.76	69.77	22
Southgate Mainline (H-650 Pipeline)	50 to 66	69.80	69.80	20
Southgate Mainline (H-650 Pipeline)	30 to 50	69.89	69.89	20
Southgate Mainline (H-650 Pipeline)	30 to 50	69.91	69.92	24
Southgate Mainline (H-650 Pipeline)	30 to 50	70.02	70.03	21
Southgate Mainline (H-650 Pipeline)	30 to 50	70.50	70.51	23
Southgate Mainline (H-650 Pipeline)	30 to 50	70.61	70.62	33
Southgate Mainline (H-650 Pipeline)	50 to 66	70.75	70.76	47
Southgate Mainline (H-650 Pipeline)	30 to 50	70.76	70.77	21
Southgate Mainline (H-650 Pipeline)	30 to 50	71.13	71.13	20
Southgate Mainline (H-650 Pipeline)	30 to 50	71.19	71.20	28
Southgate Mainline (H-650 Pipeline)	30 to 50	71.21	71.22	78

Appendix C.3-1

Potential Areas of Steep Slopes Crossed by the Southgate Project

Route	Steep Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	30 to 50	71.25	71.26	54
Southgate Mainline (H-650 Pipeline)	30 to 50	71.31	71.32	28
Southgate Mainline (H-650 Pipeline)	30 to 50	71.49	71.49	33
Southgate Mainline (H-650 Pipeline)	30 to 50	71.62	71.63	37
Southgate Mainline (H-650 Pipeline)	30 to 50	71.82	71.83	70
Southgate Mainline (H-650 Pipeline)	30 to 50	71.90	71.92	103
Southgate Mainline (H-650 Pipeline)	30 to 50	72.19	72.20	24
Southgate Mainline (H-650 Pipeline)	30 to 50	72.71	72.72	30
Southgate Mainline (H-650 Pipeline)	50 to 66	72.72	72.72	40
Southgate Mainline (H-650 Pipeline)	30 to 50	72.72	72.73	25
Southgate Mainline (H-650 Pipeline)	30 to 50	72.91	72.91	20
Southgate Mainline (H-650 Pipeline)	50 to 66	72.94	72.94	20
Southgate Mainline (H-650 Pipeline)	30 to 50	72.94	72.94	15

Methodology:

1. Steep Slope percentages are grouped as follows:
   30-50%
   50-66%
   66-80%
   80%+
2. Only crossings that are longer than 20 feet are considered. Some locations may seem smaller but they are still considered if they are a continuation of another slope group.
3. For crossings that have multiple variations of slope group within small lengths, an average slope group is assigned.
4. The length of slope crossed might be slightly shorter than actual mile post lengths because of small stretches of data that are not in slope groups.

Appendix C.3-2

Potential Areas of Side Slopes Crossed by the Southgate Project H-650

Route	Side Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	18 to 25	3.82 RR	3.83 RR	56
Southgate Mainline (H-650 Pipeline)	14 to 18	3.90 RR	3.91 RR	14
Southgate Mainline (H-650 Pipeline)	18 to 25	3.91 RR	3.92 RR	86
Southgate Mainline (H-650 Pipeline)	25+	3.92 RR	3.94 RR	111
Southgate Mainline (H-650 Pipeline)	14 to 18	8.63	8.71	298
Southgate Mainline (H-650 Pipeline)	14 to 18	9.00	9.02	70
Southgate Mainline (H-650 Pipeline)	14 to 18	9.97	10.03	283
Southgate Mainline (H-650 Pipeline)	14 to 18	15.51	15.58	244
Southgate Mainline (H-650 Pipeline)	18 to 25	16.01	16.02	40
Southgate Mainline (H-650 Pipeline)	14 to 18	16.55	16.58	98
Southgate Mainline (H-650 Pipeline)	14 to 18	16.59	16.60	43
Southgate Mainline (H-650 Pipeline)	18 to 25	17.77	17.81	168
Southgate Mainline (H-650 Pipeline)	18 to 25	17.98	18.01	157
Southgate Mainline (H-650 Pipeline)	18 to 25	18.04	18.05	52
Southgate Mainline (H-650 Pipeline)	14 to 18	19.49	19.50	62
Southgate Mainline (H-650 Pipeline)	18 to 25	19.54	19.60	233
Southgate Mainline (H-650 Pipeline)	14 to 18	19.63	19.64	40
Southgate Mainline (H-650 Pipeline)	18 to 25	21.58	21.60	87
Southgate Mainline (H-650 Pipeline)	18 to 25	21.74	21.78	155
Southgate Mainline (H-650 Pipeline)	14 to 18	22.00	22.04	134
Southgate Mainline (H-650 Pipeline)	14 to 18	22.36	22.38	87
Southgate Mainline (H-650 Pipeline)	18 to 25	22.65	22.74	406
Southgate Mainline (H-650 Pipeline)	18 to 25	23.16	23.17	60
Southgate Mainline (H-650 Pipeline)	18 to 25	23.27	23.31	179
Southgate Mainline (H-650 Pipeline)	18 to 25	25.15	25.22	216
Southgate Mainline (H-650 Pipeline)	18 to 25	28.56	28.58	67
Southgate Mainline (H-650 Pipeline)	14 to 18	28.71	28.74	70
Southgate Mainline (H-650 Pipeline)	14 to 18	29.01	29.06	177
Southgate Mainline (H-650 Pipeline)	25+	29.10	29.14	100
Southgate Mainline (H-650 Pipeline)	25+	29.36	29.43	89
Southgate Mainline (H-650 Pipeline)	18 to 25	31.34	31.37	86
Southgate Mainline (H-650 Pipeline)	18 to 25	31.67	31.69	56
Southgate Mainline (H-650 Pipeline)	18 to 25	31.88	31.95	236
Southgate Mainline (H-650 Pipeline)	25+	32.18	32.20	46
Southgate Mainline (H-650 Pipeline)	18 to 25	32.55	32.59	75
Southgate Mainline (H-650 Pipeline)	14 to 18	32.78	32.89	355
Southgate Mainline (H-650 Pipeline)	18 to 25	33.28	33.30	89
Southgate Mainline (H-650 Pipeline)	18 to 25	33.35	33.41	217
Southgate Mainline (H-650 Pipeline)	14 to 18	33.45	33.47	47
Southgate Mainline (H-650 Pipeline)	18 to 25	33.64	33.67	146

Appendix C.3-2

Potential Areas of Side Slopes Crossed by the Southgate Project H-650

Route	Side Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	18 to 25	33.70	33.73	104
Southgate Mainline (H-650 Pipeline)	18 to 25	33.88	33.92	110
Southgate Mainline (H-650 Pipeline)	18 to 25	33.95	34.01	280
Southgate Mainline (H-650 Pipeline)	18 to 25	34.33	34.35	93
Southgate Mainline (H-650 Pipeline)	18 to 25	34.56	34.60	171
Southgate Mainline (H-650 Pipeline)	18 to 25	35.03	35.11	283
Southgate Mainline (H-650 Pipeline)	14 to 18	35.21	35.26	160
Southgate Mainline (H-650 Pipeline)	18 to 25	35.30	35.34	190
Southgate Mainline (H-650 Pipeline)	14 to 18	35.52	35.53	48
Southgate Mainline (H-650 Pipeline)	18 to 25	35.55	35.56	56
Southgate Mainline (H-650 Pipeline)	18 to 25	35.93	35.95	57
Southgate Mainline (H-650 Pipeline)	14 to 18	36.18	36.22	85
Southgate Mainline (H-650 Pipeline)	18 to 25	36.67	36.74	252
Southgate Mainline (H-650 Pipeline)	18 to 25	36.90	36.93	135
Southgate Mainline (H-650 Pipeline)	14 to 18	36.96	36.98	93
Southgate Mainline (H-650 Pipeline)	14 to 18	37.05	37.09	158
Southgate Mainline (H-650 Pipeline)	14 to 18	37.21	37.22	40
Southgate Mainline (H-650 Pipeline)	18 to 25	37.53	37.55	74
Southgate Mainline (H-650 Pipeline)	14 to 18	37.63	37.66	122
Southgate Mainline (H-650 Pipeline)	14 to 18	37.78	37.81	122
Southgate Mainline (H-650 Pipeline)	14 to 18	37.84	37.86	74
Southgate Mainline (H-650 Pipeline)	14 to 18	37.90	37.92	77
Southgate Mainline (H-650 Pipeline)	14 to 18	38.02	38.05	117
Southgate Mainline (H-650 Pipeline)	18 to 25	39.05	39.09	136
Southgate Mainline (H-650 Pipeline)	14 to 18	39.37	39.45	291
Southgate Mainline (H-650 Pipeline)	14 to 18	39.48	39.49	71
Southgate Mainline (H-650 Pipeline)	14 to 18	40.64	40.66	63
Southgate Mainline (H-650 Pipeline)	18 to 25	41.42	41.50	423
Southgate Mainline (H-650 Pipeline)	18 to 25	41.58	41.59	78
Southgate Mainline (H-650 Pipeline)	18 to 25	41.69	41.77	384
Southgate Mainline (H-650 Pipeline)	18 to 25	41.97	41.99	85
Southgate Mainline (H-650 Pipeline)	18 to 25	42.13	42.16	99
Southgate Mainline (H-650 Pipeline)	18 to 25	42.35	42.42	309
Southgate Mainline (H-650 Pipeline)	14 to 18	42.46	42.48	113
Southgate Mainline (H-650 Pipeline)	18 to 25	42.84	42.85	41
Southgate Mainline (H-650 Pipeline)	18 to 25	43.80	43.82	48
Southgate Mainline (H-650 Pipeline)	25+	43.86	43.88	78
Southgate Mainline (H-650 Pipeline)	18 to 25	43.99	44.02	102
Southgate Mainline (H-650 Pipeline)	18 to 25	44.07	44.10	132
Southgate Mainline (H-650 Pipeline)	14 to 18	45.06	45.09	108

Appendix C.3-2

Potential Areas of Side Slopes Crossed by the Southgate Project H-650

Route	Side Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	14 to 18	45.86	45.91	221
Southgate Mainline (H-650 Pipeline)	14 to 18	45.95	45.98	85
Southgate Mainline (H-650 Pipeline)	25+	47.47	47.50	131
Southgate Mainline (H-650 Pipeline)	14 to 18	47.99	48.02	97
Southgate Mainline (H-650 Pipeline)	18 to 25	49.64	49.68	173
Southgate Mainline (H-650 Pipeline)	25+	49.73	49.81	415
Southgate Mainline (H-650 Pipeline)	14 to 18	50.73	50.74	40
Southgate Mainline (H-650 Pipeline)	18 to 25	51.45	51.53	326
Southgate Mainline (H-650 Pipeline)	18 to 25	52.19	52.24	213
Southgate Mainline (H-650 Pipeline)	14 to 18	54.36	54.38	64
Southgate Mainline (H-650 Pipeline)	18 to 25	54.47	54.49	75
Southgate Mainline (H-650 Pipeline)	25+	54.51	54.54	131
Southgate Mainline (H-650 Pipeline)	14 to 18	59.23	59.26	135
Southgate Mainline (H-650 Pipeline)	14 to 18	62.41	62.42	59
Southgate Mainline (H-650 Pipeline)	18 to 25	63.20	63.27	220
Southgate Mainline (H-650 Pipeline)	18 to 25	63.50	63.52	130
Southgate Mainline (H-650 Pipeline)	14 to 18	65.10 RR	65.12 RR	93
Southgate Mainline (H-650 Pipeline)	18 to 25	65.12 RR	65.12 RR	31
Southgate Mainline (H-650 Pipeline)	14 to 18	65.12 RR	65.13 RR	41
Southgate Mainline (H-650 Pipeline)	14 to 18	65.18 RR	65.19 RR	58
Southgate Mainline (H-650 Pipeline)	14 to 18	67.15	67.16	50
Southgate Mainline (H-650 Pipeline)	18 to 25	68.28	68.31	149
Southgate Mainline (H-650 Pipeline)	14 to 18	68.47	68.48	41
Southgate Mainline (H-650 Pipeline)	14 to 18	68.48	68.49	48
Southgate Mainline (H-650 Pipeline)	14 to 18	68.55	68.56	51
Southgate Mainline (H-650 Pipeline)	14 to 18	68.67	68.68	44
Southgate Mainline (H-650 Pipeline)	18 to 25	69.08	69.11	124
Southgate Mainline (H-650 Pipeline)	18 to 25	69.24	69.25	48
Southgate Mainline (H-650 Pipeline)	18 to 25	69.33	69.45	445
Southgate Mainline (H-650 Pipeline)	18 to 25	69.54	69.63	388
Southgate Mainline (H-650 Pipeline)	14 to 18	70.58	70.59	47
Southgate Mainline (H-650 Pipeline)	18 to 25	70.60	70.63	96
Southgate Mainline (H-650 Pipeline)	18 to 25	71.09	71.27	616
Southgate Mainline (H-650 Pipeline)	14 to 18	71.78	71.80	78
Southgate Mainline (H-650 Pipeline)	18 to 25	71.85	71.88	144

Appendix C.3-2

Potential Areas of Side Slopes Crossed by the Southgate Project H-650

Route	Side Slope Group	Milepost Begin	Milepost End	Length of Slope Crossed (feet)
Southgate Mainline (H-650 Pipeline)	18 to 25	72.16	72.21	180
Southgate Mainline (H-650 Pipeline)	18 to 25	72.73	72.76	160
Southgate Mainline (H-650 Pipeline)	14 to 18	72.85	72.88	147

Methodology

1. Side Slope percentages are grouped as follows:
   14-18%
   18-25%
   25%+
2. Only crossings that are longer than 40 feet are considered. Some locations may seem smaller but they are still considered if they are a continuation of another slope group.
3. For crossings that have multiple variations of slope group within small lengths, an average slope group is assigned.
4. The length of slope crossed might be slightly shorter than actual mile post lengths because of small stretches of data that are not in slope groups.

Notes: Results based on desktop analysis. Data to be verified in field. This table is consistent with the table included in Resource Report 6 of the November 2018 filing to include a 30% slope minimum.

APPENDIX C.4

Areas of Landslide Concern

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Appendix C.4

Areas of Landslide Concern along the Southgate Project

Line Name	MP	Downslope Resource	Distance from Downslope Resource	Percent Slope a/	Assigned Mitigation/Stabilization Control Measures
H-650	5.1	Stream	87.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	7.9	Stream	9.00	49	Trench Breaker Daylight Drain
H-650	8.6	Wetland	0.00	47	Trench Breaker Daylight Drain
H-650	9.97	Wetland	10.00	58	Trench Breaker Daylight Drain
H-650	10.09	Wetland	10.00	36	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	12.79	Stream	57.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	13.48	Wetland	0.00	49	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	17.3	Stream	0.00	N/A	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	18.03	Wetland	27.00	36	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	22.7	Stream	1500.00	17.6 - Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	22.85	Stream	792.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	23.27	Stream	160.00	34	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	28.8	Stream	29.00	N/A	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	29.4	Stream	334.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	31.08	Stream	0.00	N/A	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	31.1	Stream	5.00	38	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	31.1	Stream	14.50	38	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain

Appendix C.4

Areas of Landslide Concern along the Southgate Project

Line Name	MP	Downslope Resource	Distance from Downslope Resource	Percent Slope a/	Assigned Mitigation/Stabilization Control Measures
H-650	31.3	Stream	5.00	N/A	Trench Breaker Daylight Drain
H-650	31.3	Stream	20.00	42	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	31.7	Stream	175.00	17.6 – Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	32.5	Stream	68.20	34	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	32.6	Wetland	39.00	36	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	32.8	Stream	290.60	19.4 – Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	33.15	Wetland	18.50	N/A	Steep Slope Revetment, Trench Breaker Daylight Drain
H-650	33.35	Stream	50.00	N/A	Steep Slope Revetment, Trench Breaker Daylight Drain
H-650	33.35	Wetland	234.00	21 – Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	33.68	Wetland	212.00	19.4 Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	33.69	Wetland	0.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	33.7	Wetland	5.00	42	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	33.75	Stream	16.70	47	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	33.82	Stream	600.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	33.9	Stream	291.00	21 – Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	34.2	Stream	16.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	34.5	Stream	83.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain

Appendix C.4

Areas of Landslide Concern along the Southgate Project

Line Name	MP	Downslope Resource	Distance from Downslope Resource	Percent Slope a/	Assigned Mitigation/Stabilization Control Measures
H-650	34.5	Stream	45.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	35.05	Stream	122.00	17.6 – Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	36	Stream	0.00	N/A	Trench Breaker Daylight Drain
H-650	38.55	Wetland	10.00	N/A	Steep Slope Revetment, Trench Breaker Daylight Drain
H-650	38.8	Wetland	16.00	42	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	39.08	Stream	56.00	23-Side Slope	Tranverse Trench Drain, Cutoff Drain
H-650	40.58	Stream	0.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	40.58	Stream	0.00	34	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	40.75	Stream	34.00	40	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	41.1	Wetland	0.00	38	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	41.69	Stream	45.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	42.25	Stream	16.00	34	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	42.37	Home	150.00	17.6 – Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	44.1	Stream	148.00	21 – Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	44.15	Stream	81.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	45.7	Stream	72.80	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	45.89	Stream	89.00	51	Transverse Trench Drain, Cutoff Drain

Appendix C.4

Areas of Landslide Concern along the Southgate Project

Line Name	MP	Downslope Resource	Distance from Downslope Resource	Percent Slope a/	Assigned Mitigation/Stabilization Control Measures
H-650	47.03	Wetland	0.00	N/A	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	47.4	Stream	45.00	32	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	47.45	Stream	183.00	21 – Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	47.6	Stream	10.00	38	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	49.7	Home	411.00	21-Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	64.05	Stream	12.90	34	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	69.4	Stream	87.90	23 – Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	70.6	Stream	360.00	19.4 – Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	70.75	Stream	122.00	49	Trench Breaker Daylight Drain
H-650	71.2	River	186.00	27-Side Slope	Transverse Trench Drain, Cutoff Drain
H-650	71.8	Stream	20.00	36	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	71.9	River	326.00	38	Trench Breaker Daylight Drain, Trench Breaker Pass-through Drain
H-650	72.7	River	52.4	47	Trench Breaker Daylight Drain

Source:
a/ Design slope is based on desktop and field review, or range from map analysis of alignment.
b/ Based on historical imagery.
c/ Based on available landslide mapping.

APPENDIX C.5

Areas of Shallow Bedrock That May Require Blasting Along the Southgate Project

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Appendix C.5

Areas of Shallow Bedrock That May Require Blasting Along the Southgate Project Pipeline

Pipeline	Start MP	End MP	Approximate Bedrock Depth (inches)	Formation Age	Primary Bedrock Rock Type	Crossing Length (miles)
H-650	21.6	21.8	18.1	Proterozoic - Paleozoic	mylonite	0.20
H-650	22.2	22.3	18.1	Proterozoic - Paleozoic	mylonite	0.05
H-650	22.5	22.9	18.1	Upper Triassic	sandstone	0.37
H-650	23	23.1	29.1	Upper Triassic	sandstone	0.14
H-650	24.3	24.4	18.1	Upper Triassic	sandstone	0.09
H-650	24.6	24.8	29.1	Triassic	sandstone	0.23
H-650	24.9	25	18.1	Triassic	sandstone	0.06
H-650	25.5	25.7	18.1	Triassic	sandstone	0.22
H-650	32.5	32.6	15	Cambrian/Late Proterozoic	biotite gneiss	0.14
H-650	33.7	33.8	25.2	Cambrian/Late Proterozoic	biotite gneiss	0.05
H-650	33.8	33.9	25.2	Cambrian/Late Proterozoic	biotite gneiss	0.06
H-650	34.5	34.5	15	Cambrian/Late Proterozoic	felsic gneiss	0.07
H-650	38.8	39.1	15	Cambrian/Late Proterozoic	biotite gneiss	0.22
H-650	39.2	39.3	15	Cambrian/Late Proterozoic	biotite gneiss	0.08
H-650	39.3	39.3	25.2	Cambrian/Late Proterozoic	biotite gneiss	0.06
H-650	39.3	39.4	25.2	Cambrian/Late Proterozoic	felsic gneiss	0.05
H-650	40.3	40.5	15	Cambrian/Late Proterozoic	felsic gneiss	0.19
H-650	40.5	40.7	15	Cambrian/Late Proterozoic	felsic gneiss	0.19
H-650	40.7	40.8	15	Cambrian/Late Proterozoic	felsic gneiss	0.12
H-650	41.2	41.3	15	Cambrian/Late Proterozoic	felsic gneiss	0.1
H-650	41.3	41.3	15	Cambrian/Late Proterozoic	biotite gneiss	0.04
H-650	42.5	42.6	15	Cambrian/Late Proterozoic	biotite gneiss	0.14
H-650	42.9	42.9	15	Cambrian/Late Proterozoic	biotite gneiss	0.05
H-650	43.8	44.2	15	Cambrian/Late Proterozoic	biotite gneiss	0.46
H-650	45.6	46	15	Cambrian/Late Proterozoic	biotite gneiss	0.39
H-650	46.2	46.5	15	Permian/Pennsylvanian	granite	0.28
H-650	47	47.6	15	Permian/Pennsylvanian	granite	0.55
H-650	47.6	47.7	15	Cambrian/Late Proterozoic	biotite gneiss	0.17
H-650	53.7	53.8	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0.02
H-650	67.6	67.7	29.9	Cambrian/Late Proterozoic	metamorphic rock	0.07
H-650	67.9	68	29.9	Cambrian/Late Proterozoic	metamorphic rock	0.04
H-650	68.1	68.1	29.9	Cambrian/Late Proterozoic	metamorphic rock	0.06
H-650	68.9	68.9	29.9	Cambrian/Late Proterozoic	metamorphic rock	0.04
H-650	69.9	69.9	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0.02

Appendix C.5

Areas of Shallow Bedrock That May Require Blasting Along the Southgate Project Pipeline

Pipeline	Start MP	End MP	Approximate Bedrock Depth (inches)	Formation Age	Primary Bedrock Rock Type	Crossing Length (miles)
H-650	71	71	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0.06
H-650	72.6	72.6	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0.04
H-650	72.7	72.7	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0
H-650	72.7	72.8	29.9	Cambrian/Late Proterozoic	mafic metavolcanic rock	0.14
					Total	**5.26**

Notes:
Sums may not equal addends due to rounding. Addends consist of three decimal digits.

APPENDIX D

Soil Types Crossed by the Southgate Project

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Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
H-605 Pipeline													
Pittsylvania County, Virginia													
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	0	0.08	422	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
9B	Creedmoor fine sandy loam, 2 to 7 percent slopes	0.08	0.1	53	Yes	3	0.2	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	0.1	0.17	370	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	0.17	0.47	1,584	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
H-650 Pipeline i/													
Pittsylvania County, Virginia													
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	0.0 RR	0.13	792	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	0.13	0.3	950	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	0.3	0.4	475	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
9C	Creedmoor fine sandy loam, 7 to 15 percent slopes	0.4	0.45	264	Yes	3	0.2	Predominantly Non-Hydric	Low	>60	No	No	Moderately well drained
22B	Mattaponi sandy loam, 2 to 7 percent slopes	0.45	0.53	422	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Moderately well drained
9C	Creedmoor fine sandy loam, 7 to 15 percent slopes	0.53	0.61	422	Yes	3	0.2	Predominantly Non-Hydric	Low	>60	No	No	Moderately well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	0.61	0.63	106	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	0.63	0.77	739	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
9B	Creedmoor fine sandy loam, 2 to 7 percent slopes	0.77	0.89	634	Yes	3	0.2	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	0.89	0.93	211	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
9B	Creedmoor fine sandy loam, 2 to 7 percent slopes	0.93	1.06	686	Yes	3	0.2	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
9C	Creedmoor fine sandy loam, 7 to 15 percent slopes	1.06	1.15	475	Yes	3	0.2	Predominantly Non-Hydric	Low	>60	No	No	Moderately well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	1.15	1.25 RR	634	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	1.25 RR	1.35 RR	317	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
7A	Chenneby loam, 0 to 2 percent slopes, occasionally flooded	1.35 RR	1.86	2,798	Yes	5	0.44	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
41A	Wehadkee silt loam, 0 to 2 percent slopes, frequently flooded	1.86	2.16	1,584	No	6	0.41	Predominantly Hydric	High	>60	No	Yes	Poorly drained
7A	Chenneby loam, 0 to 2 percent slopes, occasionally flooded	2.16	2.19	158	Yes	5	0.44	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	2.19	2.28	475	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	2.28	2.95	3,538	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	2.95	3.16	1,056	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	3.16	3.18	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	3.18	3.29	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	3.29	3.41	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	3.41	3.64	1,162	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	3.64	3.89 RR	1,320	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	3.89 RR	4.15	1,426	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	4.15	4.31	845	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	4.31	4.44	686	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	4.44	4.81	1,954	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	4.81	4.83	53	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	4.83	5.22	2,059	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
1C	Appling sandy loam, 7 to 15 percent slopes	5.22	5.47	1,320	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
1B	Appling sandy loam, 2 to 7 percent slopes	5.47	5.64	898	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
1C	Appling sandy loam, 7 to 15 percent slopes	5.64	5.7	317	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
4B	Clifford sandy loam, 2 to 7 percent slopes	5.7	6.03	1,742	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.03	6.08	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
1B	Appling sandy loam, 2 to 7 percent slopes	6.08	6.13	264	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.13	6.25	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
39	Udorthents, loamy	6.25	6.32	370	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.32	6.57	1,373	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	6.57	6.59	106	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.59	6.74	792	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	6.74	6.86	634	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.86	6.95	475	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	6.95	6.99	211	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	6.99	7.09	528	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	7.09	7.25	845	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	7.25	7.29	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	7.29	7.33	211	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	7.33	7.38	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	7.38	7.5	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	7.5	7.55	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21E	Madison fine sandy loam, 25 to 45 percent slopes	7.55	7.61	264	No	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	7.61	7.71	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	7.71	7.78	370	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	7.78	7.84	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	7.84	7.97	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	7.97	8.02	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	8.02	8.12	528	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	8.12	8.2	475	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	8.2	8.33	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	8.33	8.46	739	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	8.46	8.5	211	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	8.5	8.53	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	8.53	8.58	317	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
21E	Madison fine sandy loam, 25 to 45 percent slopes	8.58	8.65	370	No	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	8.65	8.76	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	8.76	8.84	422	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	8.84	8.87	158	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	8.87	8.92	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	8.92	9.04	634	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	9.04	9.08	211	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	9.08	9.12	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	9.12	9.31	1,003	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	9.31	9.37	317	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	9.37	9.41	211	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	9.41	9.47	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	9.47	9.52	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	9.52	9.61	422	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	9.61	9.76	792	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
11B3	Cullen clay loam, 2 to 7 percent slopes, severely eroded	9.76	9.83	370	No	6	0.27	Non-Hydric	High	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	9.83	9.89	317	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
11C3	Cullen clay loam, 7 to 15 percent slopes, severely eroded	9.89	9.91	106	No	6	0.27	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	9.91	10.02	581	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	10.02	10.05	158	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	10.05	10.12	370	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	10.12	10.27	739	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	10.27	10.32	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	10.32	10.72	2,112	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	10.72	10.93	1,109	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	10.93	11.26	1,690	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	11.26	11.43	950	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	11.43	11.54	581	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	11.54	11.66	581	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	11.66	11.8	739	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	11.8	11.86	370	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	11.86	11.96	528	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	11.96	12.03	370	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	12.03	12.12	475	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	12.12	12.34	1,162	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	12.34	12.37	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	12.37	12.49	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	12.49	12.75	1,373	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	12.75	12.8	264	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	12.8	12.86	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	12.86	13.05	1,056	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
17B	Hiwassee loam, 2 to 7 percent slopes	13.05	13.21	792	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
18C3	Hiwassee clay loam, 7 to 15 percent slopes, severely eroded	13.21	13.42 RR	1,109	No	6	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	13.42 RR	13.47 RR	264	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	13.47 RR	13.5	211	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	13.5	13.61	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	13.61	13.67	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	13.67	13.8	686	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	13.8	13.91	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	13.91	13.93	106	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	13.93	14.05	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	14.05	14.15	528	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	14.15	14.28	686	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
21D	Madison fine sandy loam, 15 to 25 percent slopes	14.28	14.32	211	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	14.32	14.35	158	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
11C3	Cullen clay loam, 7 to 15 percent slopes, severely eroded	14.35	14.44	475	No	6	0.27	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	14.44	14.57	634	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	14.57	14.62	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
11B3	Cullen clay loam, 2 to 7 percent slopes, severely eroded	14.62	14.66	211	No	6	0.27	Non-Hydric	High	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	14.66	14.69	158	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	14.69	14.72	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
9C	Creedmoor fine sandy loam, 7 to 15 percent slopes	14.72	14.78	317	Yes	3	0.2	Predominantly Non-Hydric	Low	>60	No	No	Moderately well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	14.78	14.94	845	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	14.94	15.45	2,693	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	15.45	15.48	158	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	15.48	15.87	2,059	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	15.87	15.95	370	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	15.95	16.02	370	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	16.02	16.06	211	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	16.06	16.22	845	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	16.22	16.48	1,373	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	16.48	16.97	2,587	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	16.97	17.24	1,426	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	17.24	17.32	370	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	17.32	17.39	422	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	17.39	17.64 RR	1,690	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
W	Water	17.64 RR	17.67 RR	106	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	17.67 RR	17.81 RR	211	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	17.81 RR	17.85 RR	422	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	17.85 RR	17.89 RR	1,690	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	17.89 RR	17.94 RR	2,112	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	17.94 RR	18.01	845	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	18.01	18.4	2,112	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	18.4	18.45	211	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	18.45	18.82	2,006	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	18.82	18.88	317	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	18.88	18.99	581	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	18.99	19.05	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	19.05	19.12	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	19.12	19.22	528	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	19.22	19.3	422	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	19.3	19.35	264	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	19.35	19.59	1,267	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	19.59	19.64	317	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	19.64	19.68	158	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
21D	Madison fine sandy loam, 15 to 25 percent slopes	19.68	19.77	475	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	19.77	19.89	634	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	19.89	19.99	475	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	19.99	20.01	158	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	20.01	20.04	158	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.04	20.09	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	20.09	20.18	528	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.18	20.32	739	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	20.32	20.41	422	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.41	20.46	264	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	20.46	20.52	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.52	20.57	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	20.57	20.66	422	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.66	20.71	317	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	20.71	20.75	211	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	20.75	21	1,320	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	21	21.05	264	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	21.05	21.15	528	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	21.15	21.28	686	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	21.28	21.34	317	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	21.34	21.48	739	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	21.48	21.56	422	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
29C	Pinkston-Mayodan complex, 7 to 15 percent slopes, very stony	21.56	21.72	845	No	5	0.27	Non-Hydric	Low	18.1	Yes	No	Excessively drained
29D	Pinkston-Mayodan complex, 15 to 35 percent slopes, very stony	21.72	21.76	211	No	5	0.28	Non-Hydric	Low	18.1	Yes	No	Excessively drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	21.76	22.02	1,373	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	22.02	22.07	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	22.07	22.15	422	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	22.15	22.2	264	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
28C	Pinkston cobbly sandy loam, 7 to 15 percent slopes	22.2	22.25	264	No	5	0.3	Non-Hydric	Low	18.1	Yes	No	Excessively drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	22.25	22.28	158	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	22.28	22.32	158	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	22.32	22.33	106	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	22.33	22.46	634	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	22.46	22.53	370	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
29C	Pinkston-Mayodan complex, 7 to 15 percent slopes, very stony	22.53	22.65	634	No	5	0.27	Non-Hydric	Low	18.1	Yes	No	Excessively drained
29D	Pinkston-Mayodan complex, 15 to 35 percent slopes, very stony	22.65	22.71	317	No	5	0.28	Non-Hydric	Low	18.1	Yes	No	Excessively drained
29C	Pinkston-Mayodan complex, 7 to 15 percent slopes, very stony	22.71	22.77	317	No	5	0.27	Non-Hydric	Low	18.1	Yes	No	Excessively drained
29E	Pinkston-Mayodan complex, 35 to 50 percent slopes, very stony	22.77	22.9	686	No	5	0.28	Non-Hydric	Low	18.1	Yes	No	Excessively drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	22.9	22.96	317	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
34B	Sheva fine sandy loam, 2 to 7 percent slopes	22.96	23.1	739	No	3	0.35	Non-Hydric	Moderate	29.1	Yes	No	Moderately well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	23.1	23.18	422	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	23.18	23.26	475	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	23.26	23.31	264	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	23.31	23.64	1,742	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	23.64	23.74	581	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	23.74	23.83	475	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	23.83	23.89	317	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	23.89	24.01	634	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	24.01	24.3	1,584	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
29C	Pinkston-Mayodan complex, 7 to 15 percent slopes, very stony	24.3	24.39	475	No	5	0.27	Non-Hydric	Low	18.1	Yes	No	Excessively drained
17B	Hiwassee loam, 2 to 7 percent slopes	24.39	24.59	1,003	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
34B	Sheva fine sandy loam, 2 to 7 percent slopes	24.59	24.82	1,214	No	3	0.35	Non-Hydric	Moderate	29.1	Yes	No	Moderately well drained
18C3	Hiwassee clay loam, 7 to 15 percent slopes, severely eroded	24.82	24.83	53	No	6	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
17B	Hiwassee loam, 2 to 7 percent slopes	24.83	24.91	475	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
18C3	Hiwassee clay loam, 7 to 15 percent slopes, severely eroded	24.91	24.94	158	No	6	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
28C	Pinkston cobbly sandy loam, 7 to 15 percent slopes	24.94	25	317	No	5	0.3	Non-Hydric	Low	18.1	Yes	No	Excessively drained
17B	Hiwassee loam, 2 to 7 percent slopes	25	25.08	370	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	25.08	25.26	950	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
17B	Hiwassee loam, 2 to 7 percent slopes	25.26	25.46	1,056	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
28C	Pinkston cobbly sandy loam, 7 to 15 percent slopes	25.46	25.68	1,162	No	5	0.3	Non-Hydric	Low	18.1	Yes	No	Excessively drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	25.68	25.77	475	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	25.77	25.82	317	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	25.82	26.04	1,162	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	26.04	26.08	211	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
Rockingham County, North Carolina													
CmB	Clover sandy loam, 2 to 8 percent slopes	26.08	26.43	1,848	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	26.43	26.61 RR	950	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmB	Clover sandy loam, 2 to 8 percent slopes	26.61 RR	26.66 RR	211	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	26.66 RR	26.76 RR	528	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Clover sandy clay loam, 2 to 8 percent slopes, moderately eroded	26.76 RR	26.84	422	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
CnE2	Clover sandy clay loam, 15 to 25 percent slopes, moderately eroded	26.84	26.97 RR	634	No	5	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	26.97 RR	27.3	1,742	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
DaA	Dan River loam, 0 to 2 percent slopes, frequently flooded	27.3	27.66	1,901	No	5	0.31	Predominantly Non-Hydric	High	>60	No	No	Well drained
WhB	Wickham sandy loam, mesic, 1 to 4 percent slopes, rarely flooded	27.66	27.92 RR	1,373	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	27.92 RR	28.14 RR	1,214	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CmB	Clover sandy loam, 2 to 8 percent slopes	28.14 RR	28.37 RR	1,162	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	28.37 RR	28.43 RR	317	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CmB	Clover sandy loam, 2 to 8 percent slopes	28.43 RR	28.55 RR	581	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	28.55 RR	28.77	1,214	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmE	Clover sandy loam, 15 to 25 percent slopes	28.77	28.87	475	No	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	28.87	28.96	475	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmE	Clover sandy loam, 15 to 25 percent slopes	28.96	29.02	317	No	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	29.02	29.08	317	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmE	Clover sandy loam, 15 to 25 percent slopes	29.08	29.18	528	No	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
CmD	Clover sandy loam, 8 to 15 percent slopes	29.18	29.25	317	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CnE2	Clover sandy clay loam, 15 to 25 percent slopes, moderately eroded	29.25	29.51	1,531	No	5	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	29.51	29.84	1,742	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
DaA	Dan River loam, 0 to 2 percent slopes, frequently flooded	29.84	30.05	1,109	No	5	0.31	Predominantly Non-Hydric	High	>60	No	No	Well drained
W	Water	30.05	30.1	211	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
DaA	Dan River loam, 0 to 2 percent slopes, frequently flooded	30.1	30.21	581	No	5	0.31	Predominantly Non-Hydric	High	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	30.21	30.33	634	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	30.33	30.61	1,478	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	30.61	30.68	370	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	30.68	30.81	686	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	30.81	30.86	264	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CmD	Clover sandy loam, 8 to 15 percent slopes	30.86	30.89	106	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	30.89	30.97	422	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	30.97	31.03	317	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	31.03	31.11	422	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	31.11	31.14	158	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	31.14	31.18	158	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	31.18	31.23	264	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	31.23	31.33	528	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	31.33	31.53	1,056	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	31.53	31.58	264	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	31.58	31.61	158	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	31.61	31.65	211	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	31.65	31.66	106	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	31.66	31.72	317	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	31.72	31.81	422	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	31.81	32.14	1,742	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	32.14	32.23	475	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	32.23	32.3	370	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	32.3	32.33	158	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	32.33	32.44	581	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	32.44	32.48	158	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	32.48	32.5	106	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	32.5	32.56	317	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	32.56	32.61	264	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
DaA	Dan River loam, 0 to 2 percent slopes, frequently flooded	32.61	32.72	528	No	5	0.31	Predominantly Non-Hydric	High	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	32.72	32.75	158	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	32.75	32.83	422	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	32.83	32.92	475	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	32.92	32.98	370	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
HbA	Hatboro silt loam, 0 to 2 percent slopes, frequently flooded, long duration	32.98	33.01	106	No	5	0.21	Predominantly Hydric	High	>60	No	No	Poorly drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	33.01	33.08	370	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
HbA	Hatboro silt loam, 0 to 2 percent slopes, frequently flooded, long duration	33.08	33.11	158	No	5	0.21	Predominantly Hydric	High	>60	No	No	Poorly drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	33.11	33.14	158	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	33.14	33.32	950	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	33.32	33.54	1,162	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
JkB	Jackland fine sandy loam, 2 to 8 percent slopes	33.54	33.59	264	Yes	3	0.3	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	33.59	33.74	792	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
DeD	Devotion fine sandy loam, 6 to 15 percent slopes	33.74	33.79	264	No	3	0.27	Non-Hydric	Moderate	25.2	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	33.79	33.83	211	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
DeD	Devotion fine sandy loam, 6 to 15 percent slopes	33.83	33.89	317	No	3	0.27	Non-Hydric	Moderate	25.2	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	33.89	33.94	264	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	33.94	33.96	158	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	33.96	33.99	158	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	33.99	34.15	845	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	34.15	34.21 RR	317	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	34.21 RR	34.32	686	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	34.32	34.34	106	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	34.34	34.45	581	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	34.45	34.53	370	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	34.53	34.77	1,267	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	34.77	34.84	370	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	34.84	34.94	475	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	34.94	35	317	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	35	35.03	158	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	35.03	35.1	422	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	35.1	35.23	686	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	35.23	35.31	422	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	35.31	35.38	370	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	35.38	35.46	422	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	35.46	35.58	634	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	35.58	35.73	792	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	35.73	35.77	158	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	35.77	35.8	158	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	35.8	35.91	634	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	35.91	36.08	845	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	36.08	36.21	739	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	36.21	36.25	158	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	36.25	36.68	2,323	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	36.68	36.79	581	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	36.79	36.86	370	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	36.86	37.06	1,056	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	37.06	37.11	264	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	37.11	37.19	422	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	37.19	37.21	106	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	37.21	37.32	581	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	37.32	37.34	106	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	37.34	37.39	264	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	37.39	37.55	845	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
PpE2	Poplar Forest sandy clay loam, 15 to 25 percent slopes, moderately eroded	37.55	37.6	264	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
Ud	Udorthents, loamy	37.6	37.67	422	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
PpE2	Poplar Forest sandy clay loam, 15 to 25 percent slopes, moderately eroded	37.67	37.72	264	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	37.72	37.77	264	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	37.77	37.98	1,162	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
CfB	Clifford sandy loam, 2 to 8 percent slopes	37.98	38.03	211	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	38.03	38.14	634	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	38.14	38.22	422	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
PpE2	Poplar Forest sandy clay loam, 15 to 25 percent slopes, moderately eroded	38.22	38.37	792	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	38.37	38.5	634	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	38.5	38.55	264	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
PpB2	Poplar Forest sandy clay loam, 2 to 8 percent slopes, moderately eroded	38.55	38.57	106	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	38.57	38.59	106	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	38.59	38.78	1,003	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	38.78	38.84	317	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	38.84	38.86	106	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	38.86	38.94	370	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	38.94	38.99	264	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	38.99	39.02	211	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	39.02	39.07	211	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	39.07	39.14	370	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	39.14	39.17	211	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	39.17	39.25	422	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
DeD	Devotion fine sandy loam, 6 to 15 percent slopes	39.25	39.37	634	No	3	0.27	Non-Hydric	Moderate	25.2	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	39.37	39.46	475	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	39.46	39.65	1,056	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	39.65	39.84	950	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
ChC	Clifford-Urban land complex, 2 to 10 percent slopes	39.84	39.93	475	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
Ur	Urban land	39.93	40.13	1,109	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown
CaD	Casville sandy loam, 8 to 15 percent slopes	40.13	40.13	1,003	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	40.13	40.27 RR	<1	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	40.27 RR	40.49 RR	528	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	40.49 RR	40.51 RR	158	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	40.51 RR	40.51	370	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	40.51	40.52	<1	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	40.52	40.54	106	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	40.54	40.62	475	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
SmC	Siloam sandy loam, 4 to 10 percent slopes	40.62	40.71	475	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	40.71	40.72	53	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	40.72	40.83	634	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	40.83	41.11	1,478	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
HbA	Hatboro silt loam, 0 to 2 percent slopes, frequently flooded, long duration	41.11	41.18	370	No	5	0.21	Predominantly Hydric	High	>60	No	No	Poorly drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	41.18	41.26	422	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	41.26	41.32	317	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	41.32	41.41	475	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	41.41	41.45	264	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	41.45	41.52	370	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	41.52	41.83	1,584	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	41.83	42.08	1,373	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	42.08	42.11	158	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	42.11	42.16	317	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	42.16	42.21	211	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	42.21	42.31	528	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	42.31	42.45	739	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	42.45	42.5	264	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	42.5	42.63	739	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
PpB2	Poplar Forest sandy clay loam, 2 to 8 percent slopes, moderately eroded	42.63	42.7	370	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
PpD2	Poplar Forest sandy clay loam, 8 to 15 percent slopes, moderately eroded	42.7	42.82	634	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
PpB2	Poplar Forest sandy clay loam, 2 to 8 percent slopes, moderately eroded	42.82	42.85	158	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
PpD2	Poplar Forest sandy clay loam, 8 to 15 percent slopes, moderately eroded	42.85	42.87	106	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
PoE	Poplar Forest sandy loam, 15 to 35 percent slopes	42.87	42.88	53	No	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	42.88	42.93	264	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
PpD2	Poplar Forest sandy clay loam, 8 to 15 percent slopes, moderately eroded	42.93	43.04	528	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
PoE	Poplar Forest sandy loam, 15 to 35 percent slopes	43.04	43.13	528	No	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
PpB2	Poplar Forest sandy clay loam, 2 to 8 percent slopes, moderately eroded	43.13	43.17	211	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
PpD2	Poplar Forest sandy clay loam, 8 to 15 percent slopes, moderately eroded	43.17	43.21	211	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	43.21	43.29	370	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	43.29	43.36	370	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	43.36	43.46	528	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	43.46	43.51	264	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	43.51	43.6	475	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	43.6	43.64	211	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	43.64	43.67	158	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	43.67	43.75	422	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	43.75	43.79	211	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	43.79	43.87	422	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	43.87	43.92	317	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	43.92	43.97	211	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	43.97	44.06	528	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
SmC	Siloam sandy loam, 4 to 10 percent slopes	44.06	44.09	158	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	44.09	44.15	317	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	44.15	44.21	317	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	44.21	44.45	1,267	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	44.45	44.51	317	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	44.51	44.58	422	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	44.58	44.64	317	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	44.64	44.76	634	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	44.76	45.34	3,062	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
DcB	Davie sandy loam, 2 to 8 percent slopes	45.34	45.41	370	Yes	3	0.28	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
JkD	Jackland fine sandy loam, 8 to 15 percent slopes	45.41	45.47	317	No	3	0.3	Non-Hydric	Moderate	>60	No	Yes	Somewhat poorly drained
DcB	Davie sandy loam, 2 to 8 percent slopes	45.47	45.55	422	Yes	3	0.28	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
JkD	Jackland fine sandy loam, 8 to 15 percent slopes	45.55	45.57	106	No	3	0.3	Non-Hydric	Moderate	>60	No	Yes	Somewhat poorly drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	45.57	45.72	792	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	45.72	45.76	211	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	45.76	45.86	528	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	45.86	45.93	370	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	45.93	45.96	158	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
OkB2	Oak Level sandy clay loam, 2 to 8 percent slopes, moderately eroded	45.96	46.98 RR	<1	Yes	6	0.29	Non-Hydric	High	>60	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	45.98 RR	46.00 RR	1,478	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	46.00 RR	46.10 RR	158	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	46.10 RR	46.16 RR	158	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	46.16 RR	46.25 RR	845	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	46.25 RR	46.30 RR	317	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	46.30 RR	46.33	845	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	46.33	46.36	317	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	46.36	46.52	845	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
OkB2	Oak Level sandy clay loam, 2 to 8 percent slopes, moderately eroded	46.52	46.63	581	Yes	6	0.29	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	46.63	46.67	211	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	46.67	46.8	739	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	46.8	46.83	158	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	46.83	46.88	264	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	46.88	46.93	211	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
HbA	Hatboro silt loam, 0 to 2 percent slopes, frequently flooded, long duration	46.93	47.01	422	No	5	0.21	Predominantly Hydric	High	>60	No	No	Poorly drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	47.01	47.08	370	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	47.08	47.33	1,267	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	47.33	47.48	792	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	47.48	47.51	158	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	47.51	47.58	370	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	47.58	47.63	264	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	47.63	47.73	528	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	47.73	47.75	106	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	47.75	47.79	211	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	47.79	47.9	581	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	47.9	47.96	317	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	47.96	48.02	264	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	48.02	48.02	53	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	48.02	48.02	<1	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	48.02	48.04	53	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	48.04	48.55	2,746	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
HaB	Halifax sandy loam, 2 to 8 percent slopes	48.55	48.61	264	Yes	3	0.22	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	48.61	48.66	264	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HaB	Halifax sandy loam, 2 to 8 percent slopes	48.66	48.68	106	Yes	3	0.22	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
CaB	Casville sandy loam, 2 to 8 percent slopes	48.68	49.24	2,957	Yes	3	0.26	Non-Hydric	High	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	49.24	49.3	317	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	49.3	49.67	2,006	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	49.67	49.84 RR	792	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 8 percent slopes	49.84 RR	49.94 RR	581	Yes	3	0.22	Non-Hydric	Moderate	>60	No	No	Moderately well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	49.94 RR	50.06 RR	475	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 8 percent slopes	50.06 RR	50.17 RR	634	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	50.17 RR	50.23 RR	422	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 8 percent slopes	50.23 RR	50.44 RR	1,109	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	50.44 RR	50.52 RR	422	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 8 percent slopes	50.52 RR	50.69 RR	792	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	50.69 RR	50.76 RR	475	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CeA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	50.76 RR	50.81 RR	211	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	50.81 RR	50.98 RR	950	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	50.98 RR	51.18 RR	1,109	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
MkB2	Mecklenburg sandy clay loam, 2 to 8 percent slopes, moderately eroded	51.18 RR	51.25 RR	317	Yes	6	0.29	Non-Hydric	High	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	51.25 RR	51.3 RR	264	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained
MkB2	Mecklenburg sandy clay loam, 2 to 8 percent slopes, moderately eroded	51.3 RR	51.32 RR	211	Yes	6	0.29	Non-Hydric	High	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	51.32 RR	51.44 RR	581	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	51.44 RR	51.98	2,904	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	51.98	52.12	739	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 8 percent slopes	52.12	52.16	211	Yes	3	0.22	Non-Hydric	Moderate	>60	No	No	Moderately well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	52.16	52.17	<1	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	52.17	52.36 RR	1,056	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	52.36 RR	52.42 RR	317	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	52.42 RR	52.48 RR	158	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	52.48 RR	52.51	317	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	52.51	52.56	264	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	52.56	52.59	158	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	52.59	52.59	<1	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	52.59	52.63	211	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
Alamance County, North Carolina													
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	52.63	52.68	264	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	52.68	52.74	317	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	52.74	52.77	158	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	52.77	52.83	317	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	52.83	53.07	1,267	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	53.07	53.09	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	53.09	53.18	475	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
EnC	Enon sandy loam, 6 to 10 percent slopes	53.18	53.21	158	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	53.21	53.31	475	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	53.31	53.34	211	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	53.34	53.51	898	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	53.51	53.53	106	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	53.53	53.6	317	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	53.6	53.63	158	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	53.63	53.64	53	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	53.64	53.68	211	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
FgC	Frogsboro sandy loam, 6 to 10 percent slopes	53.68	53.72	158	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	53.72	53.74	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	53.74	53.77	106	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	53.77	53.8	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	53.8	53.89	422	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	53.89	53.9	53	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	53.9	53.92	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	53.92	53.94	158	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	53.94	53.96	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	53.96	53.99	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
FgC	Frogsboro sandy loam, 6 to 10 percent slopes	53.99	54.05	317	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.05	54.07	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	54.07	54.14	370	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.14	54.15	<1	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.15	54.16	53	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	54.16	54.18	158	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.18	54.21	158	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.21	54.24	158	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.24	54.28	211	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.28	54.3	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	54.3	54.33	158	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.33	54.41	370	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.41	54.45	264	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EsD	Enon loam, 10 to 15 percent slopes, very stony	54.45	54.47	106	No	5	0.26	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	54.47	54.51	211	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
EsD	Enon loam, 10 to 15 percent slopes, very stony	54.51	54.53	106	No	5	0.26	Non-Hydric	Moderate	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.53	54.59	317	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	54.59	54.62	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
EsD	Enon loam, 10 to 15 percent slopes, very stony	54.62	54.65	106	No	5	0.26	Non-Hydric	Moderate	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.65	54.66	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	54.66	54.79	686	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	54.79	54.85	317	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	54.85	54.88	158	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	54.88	54.9	106	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
VaC	Vance sandy loam, 6 to 10 percent slopes	54.9	54.93	158	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	54.93	54.97	211	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
CcC	Cecil sandy loam, 6 to 10 percent slopes	54.97	54.99	106	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	54.99	55.2	1,109	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	55.2	55.21	106	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	55.21	55.26	264	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	55.26	55.38	634	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 6 percent slopes	55.38	55.41	158	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	55.41	55.51	528	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	55.51	55.56	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	55.56	55.6	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	55.6	55.8	1,003	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 6 percent slopes	55.8	55.8	<1	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaE	Pacolet sandy loam, 15 to 45 percent slopes	55.8	55.82	106	No	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
LoE	Louisburg coarse sandy loam, 15 to 45 percent slopes	55.82	55.85	158	No	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	55.85	55.91	317	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	55.91	56.28	2,006	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	56.28	56.32	211	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	56.32	56.41	475	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	56.41	56.44	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
VaC	Vance sandy loam, 6 to 10 percent slopes	56.44	56.54	528	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	56.54	56.65	581	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	56.65	56.67	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	56.67	56.81	739	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	56.81	57.04	1,214	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	57.04	57.05	53	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	57.05	57.12	370	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	57.12	57.15	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	57.15	57.19	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	57.19	57.26	370	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	57.26	57.33	422	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	57.33	57.44	581	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	57.44	57.56	634	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
HeB	Helena sandy loam, 2 to 6 percent slopes	57.56	57.85	1,584	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	57.85	57.88	106	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	57.88	57.91	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	57.91	58	475	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58	58	<1	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	58	58.03	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58.03	58.04	53	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	58.04	58.08	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58.08	58.11	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	58.11	58.16	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58.16	58.27	634	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	58.27	58.28	53	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58.28	58.47	1,056	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	58.47	58.51	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	58.51	58.59	422	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	58.59	58.64	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	58.64	58.69	211	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
EnD	Enon sandy loam, 10 to 15 percent slopes	58.69	58.71	106	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	58.71	58.85	739	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	58.85	59	792	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	59	59.08	422	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	59.08	59.14	317	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	59.14	59.18	158	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	59.18	59.28	528	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	59.28	59.3	158	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	59.3	59.32	106	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	59.32	59.5	950	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	59.5	59.6	528	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	59.6	59.63	158	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	59.63	59.65	106	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	59.63	59.63	<1	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	59.65	59.68	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	59.68	59.81	686	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	59.81	60.05	1,267	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	60.05	60.22	898	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	60.22	60.67	2,429	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	60.67	60.68	<1	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	60.68	60.72	211	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	60.72	60.8	475	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	60.8	60.83	106	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	60.83	60.91	422	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	60.91	60.95	211	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
HeC	Helena sandy loam, 6 to 10 percent slopes	60.95	61.01	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	61.01	61.08	370	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	61.08	61.1	106	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	61.1	61.15	264	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
IrB	Iredell loam, 2 to 6 percent slopes	61.15	61.31	845	Yes	3	0.31	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	61.31	61.36	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	61.36	61.67	1,584	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	61.67	61.76	475	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	61.76	61.83	370	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	61.83	61.9	422	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	61.9	61.93	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	61.93	61.95	106	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
IrB	Iredell loam, 2 to 6 percent slopes	61.95	61.99	211	Yes	3	0.31	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	61.99	62.13	792	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	62.13	62.3	898	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	62.3	62.4	528	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	62.4	62.44	211	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	62.44	62.47	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	62.47	62.58	528	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	62.58	62.63	317	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	62.63	62.69	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	62.69	62.72	158	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	62.72	62.96	1,267	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	62.96	63.05	475	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	63.05	63.13	422	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	63.13	63.14	53	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
LoE	Louisburg coarse sandy loam, 15 to 45 percent slopes	63.14	63.21	370	No	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	63.21	63.35	686	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	63.35	63.45	581	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	63.45	63.46	53	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	63.46	63.51	264	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	63.51	63.55	211	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	63.55	63.59	211	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
W	Water	63.59	63.64	264	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
EnD	Enon sandy loam, 10 to 15 percent slopes	63.64	63.69	264	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	63.69	63.73	264	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	63.73	63.78	211	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	63.78	63.85	370	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	63.85	63.85	<1	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	63.85	63.85	53	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	63.85	63.9	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	63.9	63.98	422	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	63.98	64.02	264	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	64.02	64.06	158	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	64.06	64.11	264	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	64.11	64.32	1,109	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	64.32	64.4	370	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	64.4	64.42	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	64.42	64.52	581	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	64.52	64.58	317	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	64.58	64.67	475	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	64.67	64.7	158	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	64.7	64.92RR	1,162	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	64.92RR	64.93RR	53	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	64.93RR	65.0RR	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	65.0RR	65.06RR	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.06RR	65.07RR	106	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	65.07RR	65.09RR	106	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	65.09RR	65.13RR	211	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	65.13RR	65.23RR	528	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	65.23RR	65.27RR	211	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	65.27RR	65.37RR	528	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	65.37RR	65.44RR	370	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	65.44RR	65.48RR	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.48RR	65.53RR	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	65.53RR	65.52	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.52	65.53	53	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	65.53	65.58	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.58	65.64	317	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	65.64	65.64	<1	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.64	65.68	211	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
IrB	Iredell loam, 2 to 6 percent slopes	65.68	65.82	739	Yes	3	0.31	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	65.82	65.86	158	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	65.86	66.23	1,954	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	66.23	66.27	264	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	66.27	66.39	634	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	66.39	66.43	211	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
HeB	Helena sandy loam, 2 to 6 percent slopes	66.43	66.57	686	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	66.57	66.62	264	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	66.62	66.68	264	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	66.68	66.7	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	66.7	66.71 RR	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	66.71 RR	66.72 RR	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	66.72 RR	66.79 RR	370	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
HeB	Helena sandy loam, 2 to 6 percent slopes	66.79 RR	66.94 RR	686	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	66.94 RR	67.20 RR	792	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	67.20 RR	67.39 RR	53	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	67.39 RR	67.45 RR	106	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	67.45 RR	67.46 RR	53	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	67.46 RR	67.47 RR	211	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	67.47 RR	67.50 RR	317	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
VaB	Vance sandy loam, 2 to 6 percent slopes	67.50 RR	67.58 RR	264	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaC	Vance sandy loam, 6 to 10 percent slopes	67.58 RR	67.59 RR	106	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 6 percent slopes	67.59 RR	67.61 RR	475	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	67.61 RR	67.5	158	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 6 percent slopes	67.5	67.54	211	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	67.54	67.59	264	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	67.59	67.62	106	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	67.62	67.64	106	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	67.64	67.71	370	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	67.71	67.73	106	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	67.73	67.78	264	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	67.78	67.84	317	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	67.84	67.88	158	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 10 to 15 percent slopes	67.88	67.9	158	Yes	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
PaE	Pacolet sandy loam, 15 to 45 percent slopes	67.9	67.93	158	No	3	0.33	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	67.93	67.97	211	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	67.97	68.06	475	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.06	68.08	106	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	68.08	68.14	317	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.14	68.19	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	68.19	68.24	264	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.24	68.3	317	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	68.3	68.33	158	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.33	68.37	264	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	68.37	68.39	53	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.39	68.43	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	68.43	68.48	211	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	68.48	68.6	634	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	68.6	68.63	158	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CuC2	Cullen-Urban land complex, 6 to 10 percent slopes, moderately eroded	68.63	68.64	53	No	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	68.64	68.72	422	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.72	68.83	581	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	68.83	68.86	158	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	68.86	68.87	106	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	68.87	68.91	211	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	68.91	68.96	264	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
Ud	Udorthents, loamy 0 to 25 percent slopes	68.96	69.03	370	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	69.03	69.14	581	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	69.14	69.17	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	69.17	69.22	211	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	69.22	69.5	1,531	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	69.5	69.62	581	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
Ur	Urban land	69.62	69.74	634	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown
EnD	Enon sandy loam, 10 to 15 percent slopes	69.74	69.85	581	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	69.85	69.86	106	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
W	Water	69.86	69.9	158	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	69.9	69.94	211	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	69.94	69.99	264	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	69.99	70.04	264	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	70.04	70.08	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.08	70.11	211	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	70.11	70.17	264	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	70.17	70.17	53	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.17	70.25	370	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	70.25	70.25	<1	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	70.25	70.27	106	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.27	70.3	158	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.3	70.32	106	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	70.32	70.37	264	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	70.37	70.38	53	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.38	70.42	264	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.42	70.43	53	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	70.43	70.5	317	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.5	70.51	106	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.51	70.55	211	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.55	70.64	475	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.64	70.72	422	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	70.72	70.75	158	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.75	70.77	158	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.77	70.79	106	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	70.79	70.84	264	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	70.84	70.86	106	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	70.86	70.98	686	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	70.98	71.04	317	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	71.04	71.29	1,267	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	71.29	71.36	370	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
Ur	Urban land	71.36	71.46	528	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	71.46	71.73	1,478	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	71.73	71.77	211	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	71.77	71.93	845	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	71.93	72	370	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	72	72.07	370	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	72.07	72.09	106	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	72.09	72.12	158	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	72.12	72.24	686	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	72.24	72.28	158	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	72.28	72.3	158	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	72.3	72.34	211	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	72.34	72.41	370	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	72.41	72.44	211	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	72.44	72.57	686	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	72.57	72.6	211	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	72.6	72.67	370	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	72.67	72.67	<1	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	72.67	72.69	106	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	72.69	72.88 RR	739	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	72.88 RR	72.93 RR	581	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	73.01	73.05	475	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	73.05	73.16 RR	581	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	73.16 RR	73.17 RR	53	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
Aboveground Facilities													
Pittsylvania County, Virginia													
Lambert Compressor Station / Interconnect / Mainline valve 1 (MP 0.0RR)													
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
Mainline valves 2 and 3 MP 7.4 and 18.3													
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	NA	NA	NA	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
Contractor Yards													
1B	Appling sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
9B	Creedmoor fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.2	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
16B	Helena sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
16C	Helena sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
22B	Mattaponi sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Moderately well drained
22C	Mattaponi sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Low	>60	No	No	Moderately well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
26D	Fairview fine sandy loam, 15 to 25 percent slopes	NA	NA	NA	Yes	3	0.22	Non-Hydric	Moderate	>60	No	No	Well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	NA	NA	NA	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	NA	NA	NA	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	NA	NA	NA	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
Access Roads													
1B	Appling sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
1C	Appling sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
3B	Bolling fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.29	Non-Hydric	Moderate	>60	No	No	Moderately well drained
4B	Clifford sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
4C	Cecil sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
5B3	Cecil sandy clay loam, 2 to 7 percent slopes, severely eroded	NA	NA	NA	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
5C3	Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	NA	NA	NA	Yes	5	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
7A	Chenneby loam, 0 to 2 percent slopes, occasionally flooded	NA	NA	NA	Yes	5	0.44	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
8A	Chenneby-Toccoa complex, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	5	0.38	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
9B	Creedmoor fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.2	Predominantly Non-Hydric	Moderate	>60	No	No	Moderately well drained
11B3	Cullen clay loam, 2 to 7 percent slopes, severely eroded	NA	NA	NA	No	6	0.27	Non-Hydric	High	>60	No	No	Well drained
17B	Hiwassee loam, 2 to 7 percent slopes	NA	NA	NA	Yes	6	0.21	Non-Hydric	High	>60	No	No	Well drained
18C3	Hiwassee clay loam, 7 to 15 percent slopes, severely eroded	NA	NA	NA	No	6	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
21D	Madison fine sandy loam, 15 to 25 percent slopes	NA	NA	NA	Yes	3	0.37	Non-Hydric	Moderate	>60	No	No	Well drained
22C	Mattaponi sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Low	>60	No	No	Moderately well drained
23B	Mayodan fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
23C	Mayodan fine sandy loam, 7 to 15 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
23D	Mayodan fine sandy loam, 15 to 25 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
29D	Pinkston-Mayodan complex, 15 to 35 percent slopes, very stony	NA	NA	NA	No	5	0.28	Non-Hydric	Low	18.1	Yes	No	Excessively drained
29E	Pinkston-Mayodan complex, 35 to 50 percent slopes, very stony	NA	NA	NA	No	5	0.28	Non-Hydric	Low	18.1	Yes	No	Excessively drained
34B	Sheva fine sandy loam, 2 to 7 percent slopes	NA	NA	NA	No	3	0.35	Non-Hydric	Moderate	29.1	Yes	No	Moderately well drained
39	Udorthents, loamy	NA	NA	NA	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown
Rockingham County, North Carolina													
LN 3600 Interconnect (MP 28.2)													
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	NA	NA	NA	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CmB	Clover sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
T-15 Dan River Interconnect / Mainline Valve 4 (MP 30.4)													
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	NA	NA	NA	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
Mainline valve 5 (MP 42.2)													
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	NA	NA	NA	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
Contractor Yards													
ChC	Clifford-Urban land complex, 2 to 10 percent slopes	NA	NA	NA	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
LeB	Leaksville silt loam, 0 to 4 percent slopes	NA	NA	NA	No	6	0.37	Hydric	High	24	Yes	Yes	Poorly drained
SpB	Spray loam, 0 to 5 percent slopes	NA	NA	NA	No	6	0.43	Non-Hydric	High	>60	Yes	No	Well drained
Ud	Udorthents, loamy	NA	NA	NA	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
Access Roads													
BaB	Banister loam, 0 to 4 percent slopes, rarely flooded	NA	NA	NA	Yes	5	0.26	Non-Hydric	Moderate	>60	No	No	Moderately well drained
CaB	Casville sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.26	Non-Hydric	High	>60	No	No	Well drained
CcB	Cecil sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
CdB2	Cecil sandy clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.25	Non-Hydric	High	>60	No	No	Well drained
CsA	Codorus loam, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	6	0.41	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CeA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CfB	Clifford sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
CgB2	Clifford sandy clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.21	Non-Hydric	High	>60	No	No	Well drained
ChC	Clifford-Urban land complex, 2 to 10 percent slopes	NA	NA	NA	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmB	Clover sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmD	Clover sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CmE	Clover sandy loam, 15 to 25 percent slopes	NA	NA	NA	No	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnE2	Clover sandy clay loam, 15 to 25 percent slopes, moderately eroded	NA	NA	NA	No	5	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
DaA	Dan River loam, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	5	0.31	Predominantly Non-Hydric	High	>60	No	No	Well drained
FpE	Fairview-Poplar Forest complex, 15 to 25 percent slopes	NA	NA	NA	No	3	0.21	Non-Hydric	Moderate	>60	No	No	Well drained
FrD2	Fairview-Poplar Forest complex, 8 to 15 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
FrE2	Fairview-Poplar Forest complex, 15 to 25 percent slopes, moderately eroded	NA	NA	NA	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
HwD	Hiwassee loam, 8 to 15 percent slopes	NA	NA	NA	Yes	6	0.18	Non-Hydric	Moderate	>60	No	No	Well drained
IrD	Iredell fine sandy loam, 8 to 15 percent slopes	NA	NA	NA	No	3	0.3	Non-Hydric	Moderate	>60	No	Yes	Somewhat poorly drained
JkB	Jackland fine sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.3	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
NaB	Nathalie sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.18	Non-Hydric	Moderate	>60	No	No	Well drained
OkB2	Oak Level sandy clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.29	Non-Hydric	High	>60	No	No	Well drained
PaD	Pacolet sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.19	Non-Hydric	Moderate	>60	No	No	Well drained
PcD2	Pacolet sandy clay loam, 8 to 15 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.29	Non-Hydric	Moderate	>60	No	No	Well drained
PpB2	Poplar Forest sandy clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.3	Non-Hydric	High	>60	No	No	Well drained
PpE2	Poplar Forest sandy clay loam, 15 to 25 percent slopes, moderately eroded	NA	NA	NA	No	5	0.31	Non-Hydric	Moderate	>60	No	No	Well drained
RnB	Rhodhiss sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.25	Non-Hydric	High	>60	No	No	Well drained
RnD	Rhodhiss sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
RnE	Rhodhiss sandy loam, 15 to 30 percent slopes	NA	NA	NA	No	3	0.25	Non-Hydric	Moderate	>60	No	No	Well drained
SpB	Spray loam, 0 to 5 percent slopes	NA	NA	NA	No	6	0.43	Non-Hydric	High	>60	Yes	No	Well drained
SmC	Siloam sandy loam, 4 to 10 percent slopes	NA	NA	NA	No	3	0.22	Non-Hydric	High	15	No	No	Well drained
SmF	Siloam sandy loam, 10 to 45 percent slopes	NA	NA	NA	No	3	0.22	Non-Hydric	Moderate	15	No	No	Well drained
Ud	Udorthents, loamy	NA	NA	NA	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
W	Water	NA	NA	NA	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
WhB	Wickham sandy loam, mesic, 1 to 4 percent slopes, rarely flooded	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
Alamance County, North Carolina													
Mainline valves 6 and 7 (MP 55.1 and 68.7)													
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
T-21 Haw River Interconnect / Mainline valve 8 (MP 73.2RR)													
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
Access Roads													
CcB	Cecil sandy loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.22	Non-Hydric	High	>60	No	No	Well drained
CeB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
ChA	Chewacla loam, 0 to 2 percent slopes, frequently flooded	NA	NA	NA	No	5	0.26	Predominantly Non-Hydric	High	>60	No	No	Somewhat poorly drained
CnB2	Cullen clay loam, 2 to 6 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnC2	Cullen clay loam, 6 to 10 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	High	>60	No	No	Well drained
CnD2	Cullen clay loam, 10 to 15 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
CnE2	Cullen clay loam, 15 to 45 percent slopes, moderately eroded	NA	NA	NA	No	6	0.23	Non-Hydric	Moderate	>60	No	No	Well drained
EnB	Enon sandy loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnC	Enon sandy loam, 6 to 10 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	High	>60	No	No	Well drained
EnD	Enon sandy loam, 10 to 15 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
EoB2	Enon clay loam, 2 to 6 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EoC2	Enon clay loam, 6 to 10 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.28	Non-Hydric	High	>60	No	No	Well drained
EsD	Enon loam, 10 to 15 percent slopes, very stony	NA	NA	NA	No	5	0.26	Non-Hydric	Moderate	>60	No	No	Well drained
FgB	Frogsboro sandy loam, 2 to 6 percent slopes	NA	NA	NA	No	3	0.26	Non-Hydric	High	>60	No	Yes	Somewhat poorly drained
HeB	Helena sandy loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
HeC	Helena sandy loam, 6 to 10 percent slopes	NA	NA	NA	Yes	3	0.27	Non-Hydric	Moderate	>60	No	No	Moderately well drained
IrB	Iredell loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.31	Non-Hydric	Moderate	>60	No	No	Moderately well drained
LoD	Louisburg coarse sandy loam, 10 to 15 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
RvA	Riverview loam, 0 to 2 percent slopes, occasionally flooded	NA	NA	NA	Yes	5	0.39	Non-Hydric	High	>60	No	No	Well drained
RxE	Rowan-Poindexter complex, 15 to 45 percent slopes	NA	NA	NA	No	3	0.35	Non-Hydric	Moderate	29.9	No	No	Well drained
Ud	Udorthents, loamy 0 to 25 percent slopes	NA	NA	NA	No	5	0.2	Non-Hydric	Moderate	>60	No	No	Well drained
Ur	Urban land	NA	NA	NA	No	Unknown	Unknown	Non-Hydric	High	>60	Unknown	Unknown	Unknown
VaB	Vance sandy loam, 2 to 6 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	High	>60	No	No	Well drained
VaD	Vance sandy loam, 10 to 15 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	Moderate	>60	No	No	Well drained
W	Water	NA	NA	NA	No	Unknown	Unknown	Non-Hydric	Unknown	>60	Unknown	Unknown	Unknown
Guilford County, North Carolina													
Access Roads													
CeC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	NA	NA	NA	Yes	5	0.28	Non-Hydric	High	>60	No	No	Well drained
Caswell County, North Carolina													
Contractor Yards													
CaB	Casville sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	High	>60	No	No	Well drained
CaC	Casville sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.23	Non-Hydric	Moderate	Unknown	No	No	Well drained
FaB	Fairview sandy loam, 2 to 8 percent slopes	NA	NA	NA	Yes	3	0.2	Non-Hydric	Moderate	Unknown	No	No	Well drained
FbB2	Fairview sandy clay loam, 2 to 8 percent slopes	NA	NA	NA	Yes	5	0.23	Non-Hydric	High	Unknown	No	No	Well drained
HaC	Halifax sandy loam, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.24	Non-Hydric	Moderate	Unknown	No	No	Moderately well drained

Appendix D

Soil Types Crossed by the Southgate Project

Map Unit Symbol	Map Unit Name	Milepost Start	Milepost End	Crossing Length (feet)	Prime Farmland or Farmland of Statewide Importance a/	WEG b/	K Factor c/	Hydric Rating d/	Revegetation Potential e/	Depth to Bedrock (inches) f/	Stony/ Rocky (g)	Compaction Prone h/	Drainage Class
ReC	Rasalo-Enott complex, 8 to 15 percent slopes	NA	NA	NA	Yes	3	0.28	Non-Hydric	Moderate	>60	No	No	Well drained
SkE	Spriggs-Mocksville complex, 25 to 45 percent slopes	NA	NA	NA	No	3	0.3	Non-Hydric	Moderate	>60	No	No	Well drained
TmB2	Tomlin clay loam, 2 to 8 percent slopes, moderately eroded	NA	NA	NA	Yes	6	0.3	Non-Hydric	High	Unknown	No	No	Well drained

Notes:
NA = Not Applicable
a/: Prime farmland and Farmland of Statewide Importance includes soils mapped and designated as prime farmland and farmland of statewide importance by the NRCS (SSURGO reference column "farmlndcl"). Prime Farmland if drained and / or irrigated and / or reclaimed of excess salts and sodium is not included in this acreage. No areas of Farmland of local importance or unique farmland are affected by the Project.
b/: WEGs (Wind Erodibility Groups) obtained from the NRCS Soil Data Mart. WEGs range from 1 to 8, with 1 being the highest potential for wind erosion, and 8 the lowest. Highly wind erodible soils include those in wind erodibility groups 1 or 2 (SSURGO reference column "weg").
c/: Water erosion potential was determined by averaging the K factor values of horizons of each soil type. Based on the average K factor, each soil type was grouped into a water erosion class of "Low", "Moderate", and "High". Highly water erodible soils include those with a K factor greater than 0.4.
d/: "Urban Land" and "Udorthents" map units do not have a NRCS designated hydric soil status. These map units were considered to be non-hydric soils. Hydric Type is determined with Hydric Classification - Presence ("hydclprs") where if hydclprs of 0% is categorized as "Non-hydric". Values between 1% – 33% are categorized as "Predominantly Non-hydric", 34% - 66% as "Partially Hydric", 67% - 99% as "Predominantly Hydric", and 100% is categorized as "Hydric".
e/: Revegetation Potential is determined by three parameters: drainage class, K factor, and slope, each parameter assigned a value of 1, 2, or 3, then averaged. Drainage classes of excessively drained and very poorly drained are designated low (1), somewhat excessively drained and poorly drained are designated moderate (2), and well drained, moderately well drained, and somewhat poorly drained are designated high (3). Low K factor (3), Moderate (2), and High (1). Slopes of 25% or more are low (1), 8%-25% are moderate (2), and slopes of less than 8% are high (3). The average of these three scores is then taken to determine the overall low, moderate, or high revegetation potential. 1.0-1.7 = Low, 1.8-2.3 = Moderate, 2.4-3.0 = High.
f/: Depth to bedrock is not defined by the NRCS for the "Pavement and Buildings" map unit. In these cases, a depth to bedrock of >60" was assigned, which is consistent with NRCS designations for other natural and fill soils in the Project area. Shallow bedrock soils include those that have lithic or paralithic bedrock within 60 inches or less of the soil surface (SSURGO and STATGO2 reference column "rescind" and "resdept_r").
g/: Stony/Rocky soils include those with a cobbley, stony, bouldery, shaly, channery, 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/: Compaction prone was determined by texture and drainage class. Compaction prone soils are those with clay loam or finer texture, and somewhat poor, poor, and very poor drainage class (SSURGO reference column "texcl" and "drainagecl").
i/: Mileposts represent soil types crossed by the pipeline alignment only.

APPENDIX E.1

Railroads and Roads Crossed by the Southgate Project

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Appendix E.1

Railroads Crossed by the Southgate Project

County , State	Milepost	Railroad	Active or Abandoned	Proposed Crossing Method
Pittsylvania, VA	5.3	Norfolk Southern Railroad	Active	Conventional Bore
Pittsylvania, VA	25.0	Norfolk Southern Railroad	Active	Conventional Bore
Rockingham, NC	39.7	Norfolk Southern	Active	Conventional Bore
Alamance, NC	69.8	Norfolk Southern Railway	Active	Conventional Bore

Appendix E.1

Roadways Crossed by the Southgate Project

Facility, State, County	Milepost	Road Name	Surface Type	Jurisdiction	Public or Private	Crossing Method
H-605 PIPELINE						
Virginia						
Pittsylvania	N/A	N/A	N/A	N/A	N/A	N/A
H-650 PIPELINE						
Virginia						
Pittsylvania	0.7	County Road 703 / Fairview N	Asphalt	County	Public	Bore
Pittsylvania	0.9	State Route 57 / Halifax Road	Asphalt	State	Public	Bore
Pittsylvania	2.9	County Road 694 / Davis Road	Asphalt	County	Public	Bore
Pittsylvania	3.0	County Road 703 / Fairview Road	Asphalt	County	Public	Bore
Pittsylvania	4.3	County Road 1437 / Woodlawn Academy Road	Asphalt	County	Public	Bore
Pittsylvania	4.3	County Road 1437 / Woodlawn Academy Road	Asphalt	County	Public	Bore
Pittsylvania	4.4	U.S. Highway 29	Asphalt	U.S.	Public	Bore
Pittsylvania	7.2	County Road 836 / White Oak Circle	Asphalt	County	Public	Bore
Pittsylvania	7.4	County Road 718 / Dry Fork Road	Asphalt	County	Public	Bore
Pittsylvania	8.1	County Road 1099 / Hylton Lane	Asphalt	County	Public	Bore
Pittsylvania	9.4	County Road 834 / Hopewell Road	Asphalt	County	Public	Bore
Pittsylvania	10.2	County Road 1071 / Tobacco Road	Gravel	County	Public	Open Cut
Pittsylvania	10.8	State Route 41 / Franklin Turnpike	Asphalt	State	Public	Bore
Pittsylvania	12.4	County Road 865 / Hutson Road	Asphalt	County	Public	Bore
Pittsylvania	13.4	County Road 866 / Sandy Creek Road	Asphalt	County	Public	Bore
Pittsylvania	14.9	County Road 750 / Whitmell School Road	Asphalt	County	Public	Bore
Pittsylvania	15.9	County Road 844 / Mount Cross Road	Asphalt	County	Public	Bore
Pittsylvania	16.5	County Road 868 / Silver Creek Road	Asphalt	County	Public	Bore
Pittsylvania	18.3	County Road 878 / Pine Lake Road	Asphalt	County	Public	Bore
Pittsylvania	19.0	County Road 876 / Cedar Spring Road	Asphalt	County	Public	Bore

Appendix E.1

Roadways Crossed by the Southgate Project

Facility, State, County	Milepost	Road Name	Surface Type	Jurisdiction	Public or Private	Crossing Method
Pittsylvania	19.3	County Road 869 / Stony Mill Road	Asphalt	County	Public	Bore
Pittsylvania	20.0	U.S. Highway 58 / Martinsville Highway	Asphalt	U.S.	Public	Bore
Pittsylvania	22.1	County Road 875 / Horseshoe Road	Asphalt	County	Public	Bore
Pittsylvania	23.7	County Road 862 / Oak Hill Road	Asphalt	County	Public	Bore
North Carolina						
Rockingham	26.2	State Road 1745 / Buffalo Road	Asphalt	State	Public	Bore
Rockingham	26.6	State Road 770 / State Hwy 770	Asphalt	State	Public	Bore
Rockingham	30.5	State Hwy 700 / S Fieldcrest Road	Asphalt	State	Public	Bore
Rockingham	30.7	State Road 1951 / Quesinberry Road	Asphalt	State	Public	Bore
Rockingham	31.6	State Road 1951 / Quesinberry Road	Asphalt	State	Public	Bore
Rockingham	33.2	State Road 1945 / Moir Mill Road	Asphalt	State	Public	Bore
Rockingham	36.3	State Road 1980 / Mount Carmel Church Road	Asphalt	State	Public	Bore
Rockingham	36.6	State Road 1982 / Wolf Island Road	Asphalt	State	Public	Bore
Rockingham	38.8	State Road 1941 / Crutchfield Road	Asphalt	State	Public	Bore
Rockingham	39.7	U.S. Highway 29	Asphalt	U.S.	Public	Bore
Rockingham	40.4	State Road 2552 / Narrow Gauge Road	Asphalt	State	Public	Bore
Rockingham	41.6	U.S. Highway 29	Asphalt	U.S.	Public	Bore
Rockingham	42.2	U.S. Highway 158	Asphalt	U.S.	Public	Bore
Rockingham	43.2	State Road 2579 / Brooks Road	Asphalt	State	Public	Bore
Rockingham	43.4	State Road 2588 / Knowles Road	Asphalt	State	Public	Bore
Rockingham	44.9	State Road 2571 / Grooms Road	Asphalt	State	Public	Bore
Rockingham	48.4	State Road 150 / State Highway 150	Asphalt	State	Public	Bore
Rockingham	49.1	State Road 87 / State Highway 87	Asphalt	State	Public	Bore
Rockingham	49.5	State Road 2614 / High Rock Road	Asphalt	State	Public	Bore

Appendix E.1

Roadways Crossed by the Southgate Project

Facility, State, County	Milepost	Road Name	Surface Type	Jurisdiction	Public or Private	Crossing Method
Rockingham	51.7	State Road 2619 / Kernodle Road	Asphalt	State	Public	Bore
Rockingham	52.0	State Road 2658 / Parkdale Road	Asphalt	State	Public	Bore
Rockingham	52.6	Tri County Drive	Gravel	Private	Private	Open Cut
Alamance	53.1	State Road 2903 / Troxler Mill Road	Asphalt	State	Public	Bore
Alamance	53.3	State Road 1577 / Lee Lewis Road	Asphalt	State	Public	Bore
Alamance	54.1	State Road 1576 / Jug House Road	Asphalt	State	Public	Bore
Alamance	55.1	State Road 1576 / Gilliam Church Road	Asphalt	State	Public	Bore
Alamance	55.8	State Highway 87	Asphalt	State	Public	Bore
Alamance	56.4	State Road 1571 / Altamahaw Race Track Road	Asphalt	State	Public	Bore
Alamance	56.4	State Road 1649 / Lonzie Foster Trail	Gravel	State	Public	Open Cut
Alamance	57.3	State Route 1591 / Hollyfield Road”	Gravel	State	Public	Open Cut
Alamance	57.5	State Road 1565 / Dodd Road	Asphalt	State	Public	Bore
Alamance	57.8	State Road 1002 / Altamahaw Union Ridge Rd	Asphalt	State	Public	Bore
Alamance	57.9	State Road 1561 / Hub Mill Road	Asphalt	State	Public	Bore
Alamance	59.2	State Road 1595 / Danieley Water Wheel Road	Asphalt	State	Public	Bore
Alamance	60.0	State Road 1593 / Burch Bridge Road	Asphalt	State	Public	Bore
Alamance	60.3	State Road 1598 / Isley School Road	Asphalt	State	Public	Bore
Alamance	61.4	State Road 1601 / Huffines Drive	Asphalt	State	Public	Bore
Alamance	62.8	State Road 1001 / Union Ridge Road	Asphalt	State	Public	Bore
Alamance	63.1	State Highway 62	Asphalt	State	Public	Bore
Alamance	64.8	State Route 1750 / Faucette Lane	Asphalt	State	Public	Bore
Alamance	65.3RR	State Road 1729 / Deep Creek Church Road	Asphalt	State	Public	Bore

Appendix E.1

Roadways Crossed by the Southgate Project

Facility, State, County	Milepost	Road Name	Surface Type	Jurisdiction	Public or Private	Crossing Method
Alamance	66.1	State Road 1735 / N. Fonville Rd	Asphalt	State	Public	Bore
Alamance	66.4	State Road 1752 / Sandy Cross Road	Asphalt	State	Public	Bore
Alamance	68.2	Indian Village Trail	Gravel	County	Public	Open Cut
Alamance	68.7	State Road 1737 / Haw River Hopedale Road	Asphalt	State	Public	Bore
Alamance	69.0	U.S. Highway 70 / Haw River Bypass	Asphalt	U.S.	Public	Bore
Alamance	69.7	State Highway 49 / W. Main Street	Asphalt	State	Public	Bore
Alamance	69.8	State Road 1935 / Stone St	Asphalt	State	Public	Bore
Alamance	71.3	Interstate 40 / Interstate 85	Asphalt	U.S.	Public	Bore
Alamance	72.9	State Highway 54 / E Harden Street	Asphalt	State	Public	Bore

Notes:
N/A = Not Applicable
Mileposts with an “RR” indicate locations where a re-route was incorporated into the pipeline alignment.

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APPENDIX E.2

Structures within 50 Feet of the Construction Work Area

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Appendix E.2

Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Virginia								
Pittsylvania	2.3	Shed	No	East	7	1,720	N/A	Protect
Pittsylvania	2.3	Shed	No	East	0	1,821	N/A	Protect
Pittsylvania	2.3	Shed	No	East	4	1,871	N/A	Protect
Pittsylvania	2.3	Shed	No	East	19	1,967	N/A	Protect
Pittsylvania	2.3	Shed	No	East	0	2,012	N/A	Protect
Pittsylvania	4.5	House	Yes	East	4	735	RSS-H650-024	Use existing driveway (TA-PI-007) to pass by residences. Post both enter and exit caution/slow signage to alert contractors. Proposed Barricade Fence 100 linear feet from corner of house.
Pittsylvania	4.5	Garage	No	East	0	663	RSS-H650-024	Protect
Pittsylvania	4.5	Garage	No	East	0	748	RSS-H650-024	Protect
Pittsylvania	4.5	Tobacco Shed	No	East	10	880	N/A	Protect
Pittsylvania	4.5	Barn	No	East	0	930	RSS-H650-024	Protect
Pittsylvania	4.5	Well Pump House	No	East	17	921	N/A	Protect
Pittsylvania	5.1	House	Yes	East	48	2,886	N/A	Protect
Pittsylvania	6.5	Office	Yes	West	30	1,283	N/A	Protect
Pittsylvania	9.0	Barn	No	West	14	1,445	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Pittsylvania	9.0	Barn	No	West	14	1,482	N/A	Protect
Pittsylvania	9.0	Tobacco Shed	No	West	5	1,642	N/A	Protect
Pittsylvania	10.3	2-Story House	Yes	East	34	59	RSS-H650-016	Protect – Proposed barricade fence.
Pennsylvania	10.3	Porch	Yes	East	22	46	RSS-H650-016	Protect – Proposed barricade fence
Pittsylvania	10.3	Garage	No	East	29	54	RSS-H650-016	Protect
Pittsylvania	10.3	Shed	No	East	0	10	RSS-H650-016	Remove
Pittsylvania	10.6	Shed	No	East	49	110	N/A	Protect
Pittsylvania	10.7	House - 2 story	Yes	East	28	88	N/A	Protect
Pittsylvania	10.8	Mailbox stone column	No	West	0	14	N/A	Remove
Pittsylvania	10.8	Stone entry wall	No	West	0	0	N/A	Remove
Pittsylvania	10.8	Stone entry wall	No	East	0	14	N/A	Remove
Pittsylvania	13.1	Shed	No	East	13	205	N/A	Protect
Pittsylvania	13.4	House - 1 story	Yes	West	50	90	N/A	Protect
Pittsylvania	13.7	Old Cabin	No	West	0	40	N/A	Remove
Pittsylvania	14.9	House	Yes	East	46	152	N/A	Protect
Pittsylvania	16.0	Shed	No	East	0	164	N/A	Protect
Pittsylvania	16.3	Mobile home - single wide	Yes	East	26	86	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Pittsylvania	16.7	House	Yes	West	22	282	N/A	Use existing driveway (TA-PI-041) to pass by residences. Post both enter and exit caution/slow signage to alert contractors.
Pittsylvania	17.2	Barn	No	East	0	1,718	N/A	Protect
Pittsylvania	17.2	House	Yes	East	31	1,857	N/A	Stay within access road TA-PI-043 limits.
Pittsylvania	17.5	Shed	No	West	29	413	N/A	Protect
Pittsylvania	18.4	Tobacco Shed	No	West	5	29	N/A	Protect
Pittsylvania	18.4	Tobacco Shed	No	West	10	34	N/A	Protect
Pittsylvania	19.1	Garage	No	East	46	108	N/A	Protect
Pittsylvania	19.6	Shed	No	West	34	93	N/A	Protect
Pittsylvania	19.9	Business - auto sales	No	West	33	288	N/A	Protect
Pittsylvania	20.2	Garage	No	East	21	35	N/A	Protect
Pittsylvania	20.2	Mobile home	Yes	East	21	81	RSS-H650-004	Install safety fence at limit of workspace extending 100 feet from house.

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Pittsylvania	20.3	Car awning	No	East	0	44	N/A	Protect
Pittsylvania	20.3	Mobile home	Yes	East	14	61	RSS-H650-005	The workspace has been adjusted in this location. Proposed barricade fence. Protect
Pittsylvania	22.0	2-Story House	Yes	East	45	133	N/A	Protect
Pittsylvania	22.2	House - 1 story, fallen down	No	East	0	79	N/A	Protect if possible or Remove
North Carolina								
Rockingham	28.1	Shed	No	West	33	3,678	N/A	Protect
Rockingham	29.2	Shed	No	East	29	1,217	N/A	Protect
Rockingham	29.2	Shed	No	East	26	1,185	N/A	Protect
Rockingham	29.6	Mobile Home	Yes	West	43	1,680	N/A	Protect
Rockingham	30.0	Barn	No	West	0	1,397	RSS-H650-030	Protect
Rockingham	30.0	House	Yes	West	18	1,422	RSS-H650-030	Stay within access road TA-RO-080 limits.

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Rockingham	30.5	House - 1 story, abandoned	No	North	3	43	RSS-H650-031	Protect
Rockingham	30.5	House - 1 story	Yes	South	29	122	N/A	Protect
Rockingham	30.7	House – 1 Story	Yes	East	40	100	N/A	Protect
Rockingham	31.7	House - 1 story	Yes	North	46	86	N/A	Protect
Rockingham	32.5	Shed	No	East	4	1,467	N/A	Protect
Rockingham	32.5	1-Story House	Yes	East	20	1,430	RSS-H650-025	Stay within limits of access road TA-RO-085. Proposed barricade fence 100 linear feet from corner of house.
Rockingham	34.1	Garages	No	East	38	500	N/A	Protect
Rockingham	35.4	Shed - abandoned	No	North	0	232	N/A	Protect if possible or remove
Rockingham	35.4	Mobile Home	Yes	North	32	512	N/A	Protect
Rockingham	36.4	Abandoned cabin	No	North	52	112	N/A	Protect
Rockingham	36.4	Abandoned cabin	No	North	37	97	N/A	Prorect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Rockingham	36.5	Abandoned cabin	No	North	32	91	N/A	Proect
Rockingham	36.5	Abandoned cabin	No	North	30	90	N/A	Protect
Rockingham	36.5	Abandoned cabin	No	North	30	93	N/A	Protect
Rockingham	36.7	Barn	No	South	25	64	N/A	Protect
Rockingham	37.1	House - 1 story, abandoned	No	East	0	48	N/A	Protect if possible or remove.
Rockingham	37.1	House - 1 story	Yes	East	45	48	1,360	Protect
Rockingham	40.3	Shed	No	East	9	35	N/A	Protect
Rockingham	40.3	House - 1 story	Yes	East	11	48	RSS-H650-007	The workspace has been adjusted in this location. Proposed barricade fence. Protect
Rockingham	40.9	House	Yes	West	50	1,304	N/A	Protect
Rockingham	41.8	Barn	No	North	31	718	N/A	Protect
Rockingham	42.4	Shed	No	West	9	47	N/A	Protect
Rockingham	43.1	Garage	No	East	5	46	N/A	Protect
Rockingham	43.1	1-Story House	No	Est	11	114	RSS-H650-039	Protect
Rockingham	43.9	Shed, abandoned	No	South	2	886	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Rockingham	44.1	Shed	No	East	0	1,615	RSS-H650-026	Protect
Rockingham	44.1	1- Story House	Yes	East	3	1,612	RSS-H650-026	Stay within limits of access road TA-RO-122. Proposed barricade fence.
Rockingham	45.0	House - 2 story, abandoned	No	West	27	110	N/A	Protect
Rockingham	46.1	Storage building	No	North	24	718	N/A	Protect
Rockingham	46.1	Mobile home	Yes	North	32	925	N/A	Protect
Rockingham	46.1	1-Story House	Yes	South	16	1,675	RSS-H650-027	Stay within limits of access road TA-RO-127. Proposed barricade fence.
Rockingham	46.1	Mobile home	Yes	South	38	1,675	N/A	Stay within limits of access road TA-RO-127.
Rockingham	49.1	House - 2 story, log cabin, abandoned	No	Crosses	0	0	RSS-H650-001	To be removed
Rockingham	49.3	Dilapidated shack	No	West	0	3	RSS-H650-002	To be removed
Rockingham	49.3	Chicken coop	No	Crosses	0	0	RSS-H650-002	To be removed
Rockingham	49.3	Shed	No	East	0	31	RSS-H650-002	To be removed

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Rockingham	49.3	House - 2 story, abandoned	No	East	11	59	RSS-H650-002	The workspace has been adjusted in this location Protect
Rockingham	49.3	Smoke House	No	East	0	10	RSS-H650-002	To be removed
Rockingham	46.3	Shed	No	East	0	62	N/A	Relocate if possible, or remove.
Rockingham	49.8	Car awning	No	South	46	635	N/A	Protect
Rockingham	52.6	Tractor awning	No	North	21	153	N/A	Protect
Alamance	52.9	1-Story House	Yes	East	38	130	N/A	Protect
Alamance	53.0	Barn, abandoned	No	East	48	183	N/A	Protect
Alamance	53.0	Barn, abandoned	No	East	20	155	N/A	Protect
Alamance	53.0	Shed	No	East	0	33	N/A	Relocate if possible, or remove.
Alamance	53.0	Falling down wood building	No	East	0	57	N/A	Remove
Alamance	54.7	Barn	No	West	5	1,976	N/A	Protect
Alamance	54.7	Barn	No	West	15	2,071	N/A	Protect
Alamance	54.7	Barn	No	West	0	2,058	N/A	Protect
Alamance	54.7	Barn	No	West	0	2,210	N/A	Protect
Alamance	54.7	House	No	West	28	2,215	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Alamance	54.7	House, 1-Story	Yes	West	29 b/	2,100	RSS-H650-040	Protect
Alamance	56.8	Shed	No	West	10	219	N/A	Protect
Alamance	57.3	Shed	No	East	17	73	N/A	Protect
Alamance	57.3	Garage	No	East	16	106	N/A	Protect
Alamance	57.8	Barn, abandoned	No	East	6	120	N/A	Protect
Alamance	57.8	Mobile home	Yes	North	11	83	RSS-H650-008	The workspace has been adjusted in this location. Proposed barricade fence. Protect
Alamance	58.6	Old Cabin	No	South	0	84	RSS-H650-042	Protect if possible, likely to be removed
Alamance	58.6	Old Cabin	No	South	0	14	RSS-H650-042	Protect if possible, likely to be removed
Alamance	59.1	1-Story House	Yes	South	43	115	N/A	Protect
Alamance	59.1	Shed	No	South	0	91	N/A	Protect
Alamance	59.2	1-Story House	Yes	South	44	84	N/A	Protect
Alamance	62.5	Barn	No	North	9	62	N/A	Protect
Alamance	62.7	1-Story House	No	North	6	515	RSS-H650-037	Protect
Alamance	62.5	Barn	No	North	9	62	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Alamance	67.0	Barn	No	West	4	63	N/A	Protect
Alamance	67.3	1-Story House	Yes	West	12	795	RSS-H650-028	Stay within limits of access road TA-AL-180. Proposed barricade fence 100 linear feet from corner of house.
Alamance	67.3	1-Story House	Yes	West	18	1,013	RSS-H650-028	Stay within limits of access road TA-AL-180. Proposed barricade fence 100 linear feet from corner of house.
Alamance	67.3	1-Story House	Yes	West	8	921	RSS-H650-028	Stay within limits of access road TA-AL-180. Proposed barricade fence 100 linear feet from corner of house.
Alamance	67.3	Barn	Yes	West	15	708	RSS-H650-028	Protect
Alamance	67.3	Barn	Yes	West	2	600	RSS-H650-028	Protect
Alamance	67.9	Barn	No	East	6	1,146	N/A	Protect
Alamance	68.2	1-Story House	No	South	10	857	RSS-H650-038	Protect
Alamance	68.2	House	Yes	North	43	1055	N/A	Protect
Alamance	68.2	House	No	South	28	1203	N/A	Protect
Alamance	68.2	Mobile home	No	South	28	1143	N/A	Protect
Alamance	68.2	Car port	No	North	34	655	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Alamance	68.6	Barn	No	North	0	76	N/A	Protect
Alamance	69.1	2-Story House	Yes	East	23	88	RSS-H650-009	Install safety fence at limit of workspace extending 100 feet from house.
Alamance	69.3	Shed	No	North	7	66	N/A	Protect
Alamance	69.4	Chicken / rabbit coop	No	North	0	0	N/A	Remove or Relocate
Alamance	69.4	Shed	No	North	0	4	N/A	Remove or Relocate
Alamance	69.5	Shed in concrete	No	North	28	87	N/A	Protect
Alamance	69.5	Shed	No	East	48	117	N/A	Protect
Alamance	69.5	Shed	No	North	43	103	N/A	Protect
Alamance	69.5	Warehouse	No	South	32	335	N/A	Protect
Alamance	69.6	1-Story House	Yes	West	6	31	RSS-H650-017	Install safety fence at limit of workspace extending 100 feet from road right-of-way and extending 100 feet from the house to the north.
Alamance	69.6	Portable Building	No	East	38	100	N/A	Protect

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Alamance	69.6	Business - textiles	No	East	17	36	N/A	Protect
Alamance	69.7	2-Story House	Yes	East	8	33	RSS-H650-018	Install safety fence at limit of workspace from road right-of-way and extending 100 from the house to the south.
Alamance	69.7	Garage	No	East	31	91	N/A	Protect
Alamance	69.7	Fire station	No	West	4	44	N/A	Protect
Alamance	69.7	Business	No	West	0	38	N/A	Protect
Alamance	69.7	Pavilion	No	West	0	0	N/A	Remove
Alamance	69.8	Garage	No	West	6	100	N/A	Protect
Alamance	69.8	Shed	No	West	0	27	N/A	Remove or Relocate
Alamance	69.8	Shed	No	East	0	0	N/A	Remove or Relocate
Alamance	69.8	Shed	No	East	0	0	N/A	Remove or Relocate
Alamance	69.8	Barn	No	West	10	100	N/A	Protect

Appendix E.2

Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Alamance	69.8	1-Story House	Yes	West	0	56	RSS-H650-006	Exclude house from ATWS by installing safety fence around the house, leaving the front (street side) of the house open for occupant access. Protect
Alamance	70.0	Pump House	No	East	44	154	N/A	Protect
Alamance	70.7	Shed, fallen down	No	West	35	76	N/A	Protect
Alamance	71.4	Green House	No	East	48	107	N/A	Protect
Alamance	71.4	Green House	No	East	38	100	N/A	Protect
Alamance	72.2	Shed	No	East	42	174	N/A	Protect
Alamance	72.7	Garage	No	East	32	97	N/A	Protect
Alamance	72.8	Shed	No	East	16	64	N/A	Protect
Alamance	72.8	Garage	No	West	16	56	RSS-H650-015	N/A
Alamance	72.8	Garage	No	East	0	33	RSS-H650-015	Protect if possible, if not it will need to be removed
Alamance	72.8	Camper	No	East	22	157	RSS-H650-015	Protect
Alamance	72.9	Garage	No	East	39	99	N/A	Protect
Alamance	72.9	Mobile home	Yes	N/A	0	37	RSS-H650-036	Protect
Alamance	72.9	1-Story House - Abandoned	No	N/A	0	0	RSS-H650-036	Remove

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Structures within 50 Feet of the Southgate Project

State, County	Approximate Milepost	Building Type (House, Shed, Garage, etc.)	Occupied (yes/no)	Direction from Pipeline Centerline (North, East, South, West)	Distance from Edge of closest workspace limit (feet)	Distance From Centerline of easement (feet)	Residential Construction Plan Number	Mountain Valley Proposed Action
Rockingham	CY-05	Building	No	West	0	15,620	RSS-H650-003	Install safety fence around the house at a 1-foot off-set from the property line.
Rockingham	CY-05	Fuel bays	No	West	0	15,418	N/A	N/A
Rockingham	CY-05	Truck stop	No	West	0	15,368	N/A	N/A
Rockingham	CY-05	Garage bays	No	West	0	15,325	N/A	N/A
Rockingham	CY-05	Warehouse	No	West	0	14,825	N/A	N/A
Rockingham	CY-05	Garage	No	West	0	14,725	N/A	N/A
Rockingham	CY-08	Garage	No	West	50	14,189	N/A	N/A
Guilford	CY-09	Commercial	No	West	20	54,620	N/A	N/A
Pittsylvania	CY-03	Warehouse	No	East	0	58,418	N/A	N/A
Pittsylvania	CY-01	House - 1 story	No	North	0	1,511	N/A	N/A
Pittsylvania	CY-01	Garage	No	North	0	1,586	N/A	N/A

APPENDIX F.1

Figures of Projects Contributing to Cumulative Impacts

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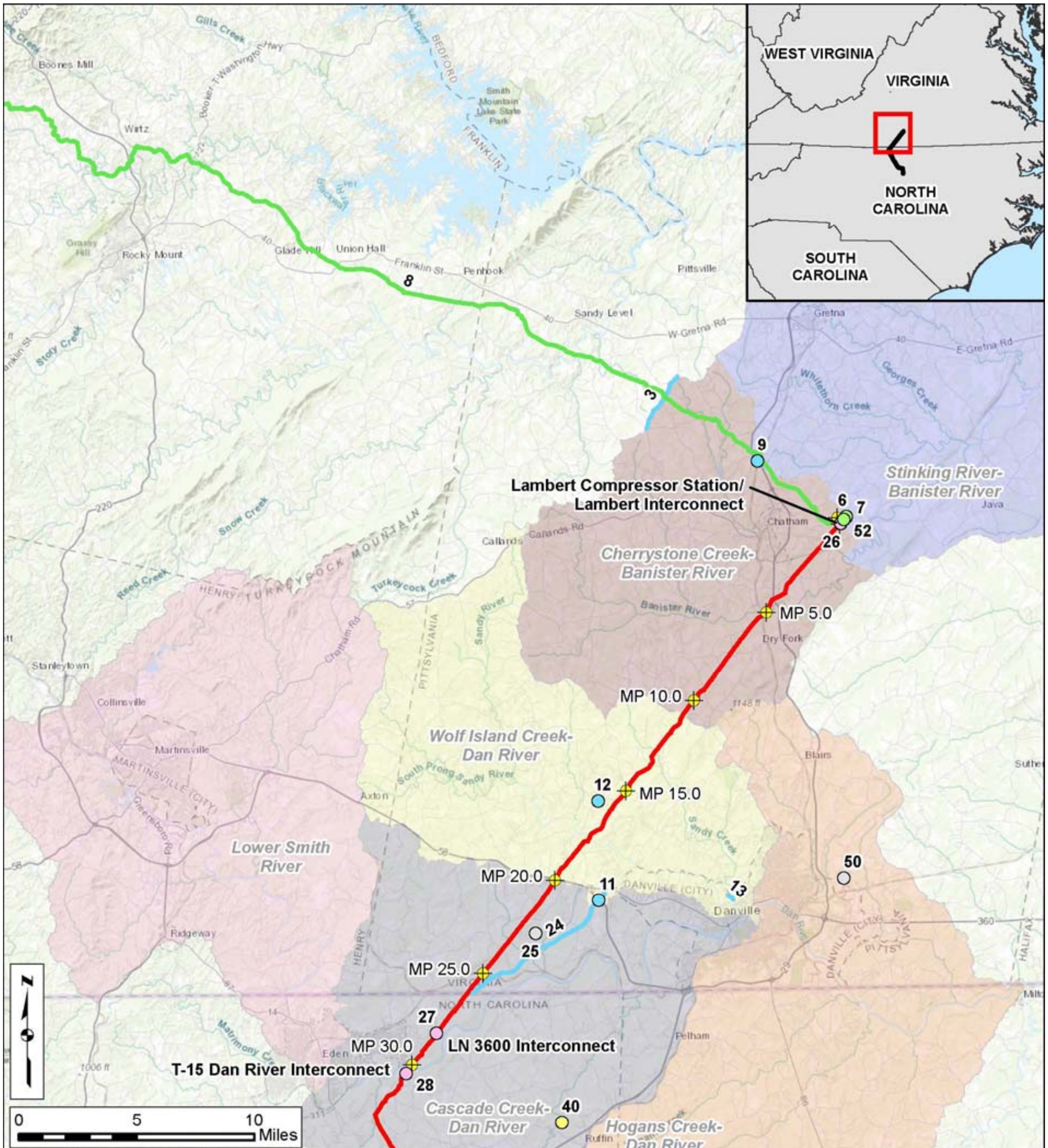


Proposed Pipeline Route	Energy
FERC-Jurisdictional	FERC-Jurisdictional
Transportation	Non-Jurisdictional
Milepost	Transportation
	Other

Contains ID related to projects in Table 1

Figure 1

Southgate Project

Projects Contributing to Cumulative Impacts
HUC 10 Watersheds

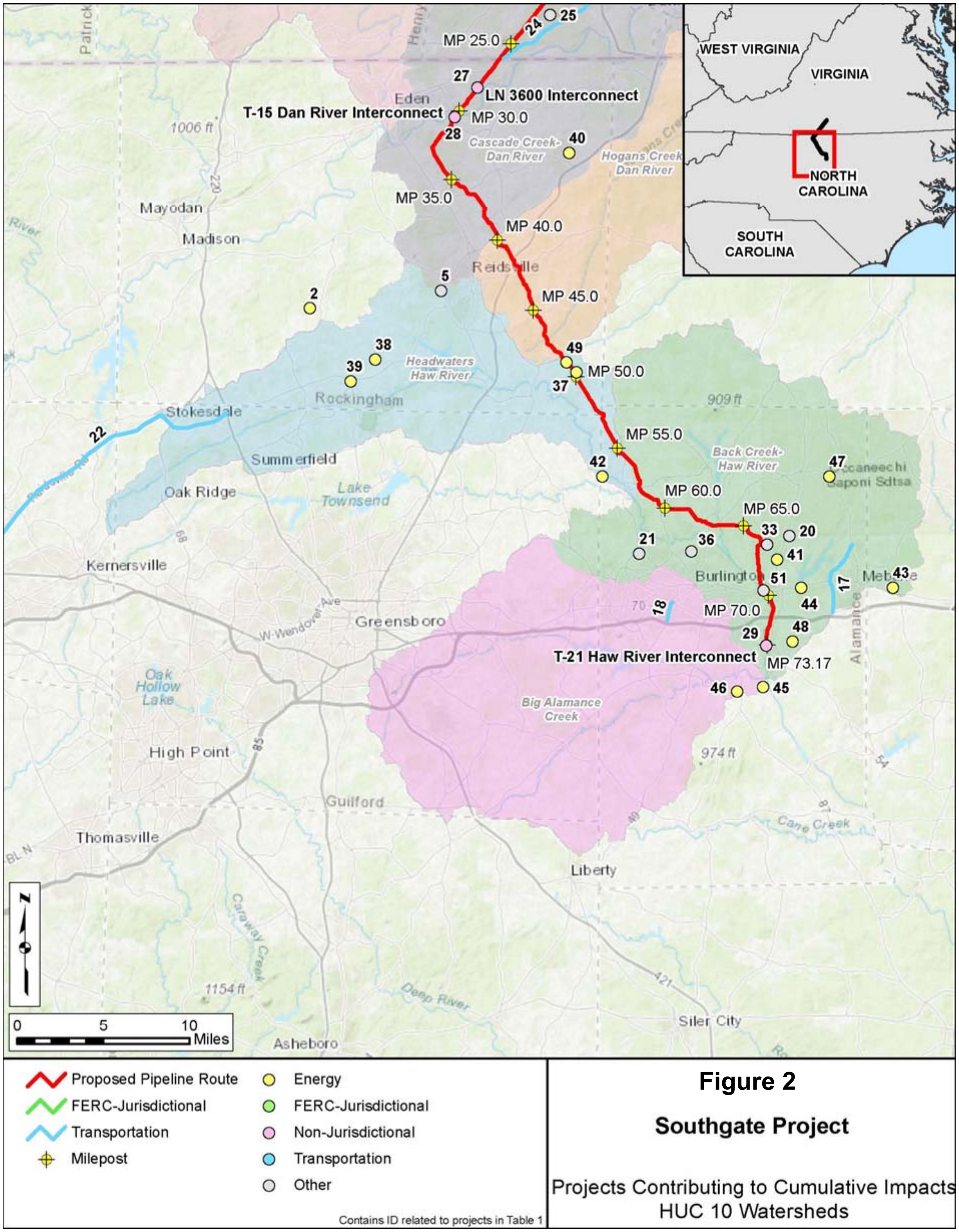
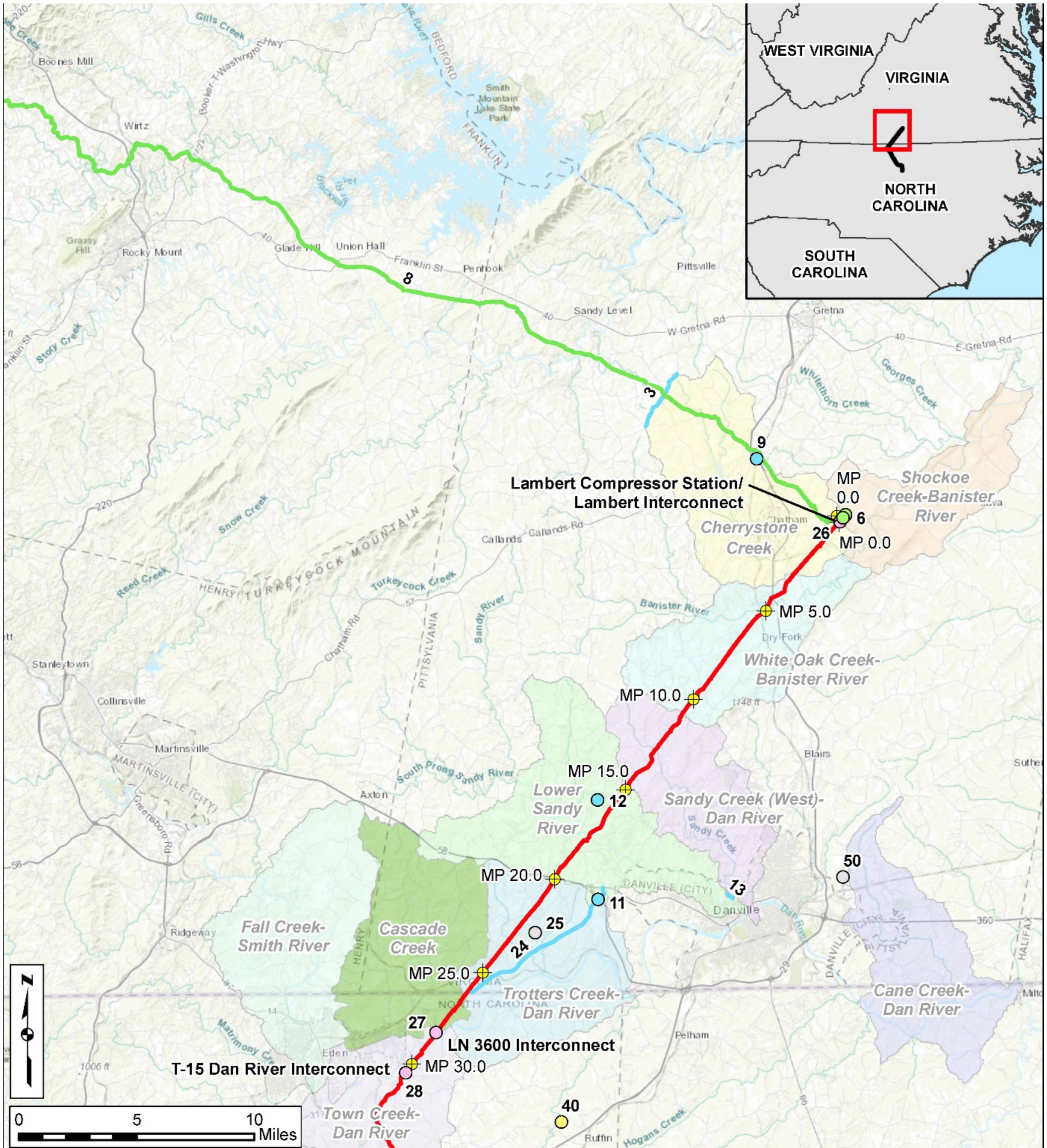


Figure 2

Southgate Project

Projects Contributing to Cumulative Impacts
HUC 10 Watersheds



Proposed Pipeline Route
FERC-Jurisdictional
Transportation
Milepost

Energy
FERC-Jurisdictional
Non-Jurisdictional
Transportation
Other

Contains ID related to projects in Table 1

Figure 3

Southgate Project

Projects Contributing to Cumulative Impacts
HUC 12 Watersheds

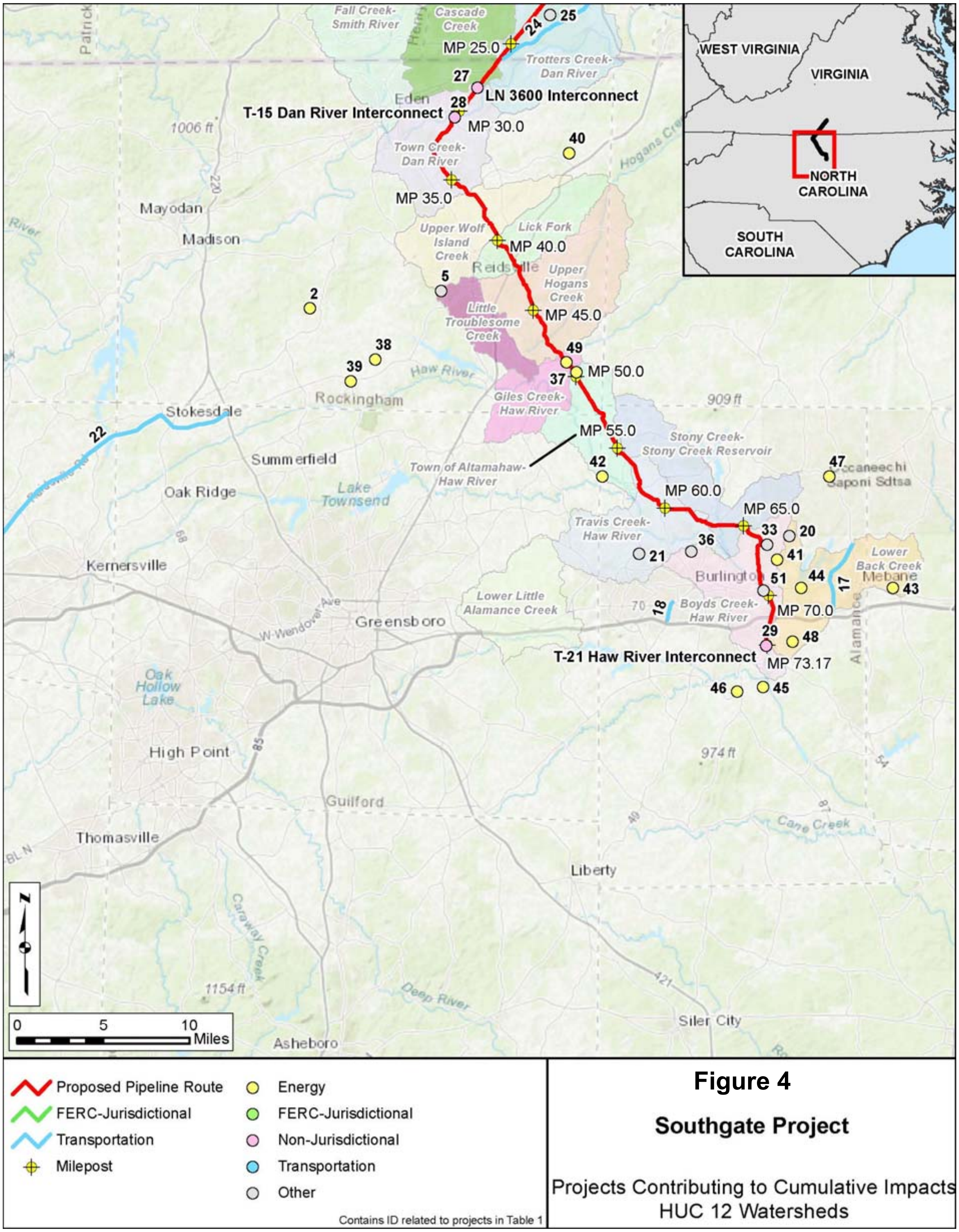


Figure 4

Southgate Project

Projects Contributing to Cumulative Impacts
HUC 12 Watersheds

APPENDIX F.2

Table of Other Projects in the Geographic Scope of Analysis Considered for Cumulative Impacts

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APPENDIX F.2

Other Projects in the Geographic Scope of Analysis Considered for Cumulative Impacts

Project Type	Project ID / Project Facility a/	Description of Facilities	Temporal Status	Acres Affected b/	Approximate Distance from Southgate Project d/	Shared Watershed (Level HUC-12)	Socioeconomics/ Environmental Justice	Water Resources and Wetlands	Vegetation, Wildlife and Fisheries	Land Use, Recreation, and Visual Resources	Cultural Resources	Air Quality and Noise
[No Shared HUC 10 watershed] (Rockingham County, NC)) c/												
Energy Projects	(2) Reidsville Energy Center	500 MW natural gas electric generating facility owned by NTE Energy in Rockingham County, North Carolina.	Construction to start Summer 2019, pending financing	20 acres	12 miles	No shared HUC 12 watershed	X					
Cherrystone Creek-Banister River HUC 10 Watershed (Pittsylvania County, VA) c/												
FERC-jurisdictional Natural Gas Interstate Transportation Projects	(6) Virginia Southside Expansion	Also shares Stinking River-Banister River HUC 10 watershed. Approximately 10 miles (out of 100 miles total) of new 24-inch diameter pipeline from Transco mainline in Pittsylvania County, Virginia and into Halifax, Charlotte, and Mecklenburg. Terminates in Brunswick County, Virginia. Construction of CS 166 in Pittsylvania County, Virginia. Operated by Transco.	In-service	1,454.3 acres for construction 119.0 acres for operation	0.4 miles	Cherrystone Creek Shockoe Creek-Banister River	X	X	X	X	X	X
FERC-jurisdictional Natural Gas Interstate Transportation Projects	(52) Virginia Southside Expansion II	Also shares Stinking River-Banister River HUC 10 watershed. Upgrades to CS 166 in Pittsylvania County, Virginia. Modifications to 19 existing facilities in North Carolina and Virginia. Construction activities in Brunswick and Greensville County, Virginia. New CS in Prince William County, Virginia	In-service	180.1 acres for construction 29.3 acres for operation	0 miles	Cherrystone Creek Shockoe Creek-Banister River	X	X	X	X	X	X
FERC-jurisdictional Natural Gas Interstate Transportation Projects	(8) Mountain Valley Pipeline	Also shares Stinking River-Banister River HUC 10 watershed. Approximately 303 miles of 42-inch pipeline and 3 new compressor stations from northwestern West Virginia to southern Virginia. Operated by Mountain Valley Pipeline, LLC and Equitrans, LP	Under Construction.	6,363.4 acres for construction 2,117.8 acres for operation	0 miles	Cherrystone Creek Shockoe Creek-Banister River	X	X	X	X	X	X
FERC-jurisdictional Natural Gas Interstate Transportation Projects	(7) Southeastern Trail	Also shares Stinking River-Banister River HUC 10 watershed Approximately 7.7 miles of 42-in. pipeline looping facilities in Virginia, horsepower additions at existing compressor stations in Virginia, and piping and valve modifications on other existing facilities in South Carolina, Georgia, and Louisiana Compressor Station 165 upgrade in Chatham, VA within Pittsylvania County, VA. Operated by Transco.	Application Filed April 2018. Construction to begin Q3 of 2019. Planned in-service November 2020	466 acres construction 42.6 acres for operation	0.4 miles	Cherrystone Creek	X	X	X	X	X	X
Non-Jurisdictional Facilities associated with Southgate	(26) Lambert interconnect and MLV 1	New interconnecting facility to the Mountain Valley Pipeline system via the H-605 pipeline	Will be reviewed by local agencies prior to construction	20.5 acres construction 11.7 acres operation	0 miles	Cherrystone Creek	X	X	X	X	X	X
Transportation/ Roadway Projects	(3) Climax Road Widening	Road widening to a minimum of 20 feet to accommodate traffic	Planning	Not Available	8.9 miles	Cherrystone Creek						

APPENDIX F.2

Other Projects in the Geographic Scope of Analysis Considered for Cumulative Impacts

Project Type	Project ID / Project Facility a/	Description of Facilities	Temporal Status	Acres Affected b/	Approximate Distance from Southgate Project d/	Shared Watershed (Level HUC-12)	Socioeconomics/ Environmental Justice	Water Resources and Wetlands	Vegetation, Wildlife and Fisheries	Land Use, Recreation, and Visual Resources	Cultural Resources	Air Quality and Noise
Transportation/ Roadway Projects	(9) U.S. Route 29 South over Norfolk Southern Railroad / VADOT	Replacement of the bridge on U.S. Route 29 South over Norfolk Southern Railroad with approaches on this Principal Rural Arterial roadway in Pittsylvania County	Complete 2017	0.4 acres	4.4 miles	Cherrystone Creek						
Wolf Island Creek-Dan River HUC 10 Watershed (Henry/**Pittsylvania Counties, VA)** c/												
Transportation/ Roadway Projects	(11) Route 58 over Route 311 / VADOT	About 3.3 million in upgrades to the intersection of Berry Hill Road and U.S. 58 West of Danville to accommodate traffic for the nearby Berry Hill Road industrial Park	Planning	8 acres	2.0 miles	Lower Sandy River						
Transportation/ Roadway Projects	(12) Stony Mill Road / VADOT	The construction of a single lane roundabout at the intersection of Stony Mill Road and Tunstall High Road- 2.2 million	Planning	0.4 acres	0.5 miles	Lower Sandy River						
Transportation/ Roadway Projects	(13) Mount Cross Road / VADOT	A two-phase plan to widen Mount Cross Road to the city limits, making the road a five-lane section with a two-way center turn lane with a new park and ride lot and sidewalk -17 million	Planning	3.3 acres	6.1 miles	Sandy Creek (West) –Dan River						
Cascade Creek-Dan River HUC 10 Watershed (Caswell/**Rockingham Counties, NC and** Henry/**Pittsylvania Counties, VA)** c/												
Non-Jurisdictional Facilities associated with Southgate	(27) LN 3600 Interconnect and Receipt Meter Station	New interconnect to the East Tennessee pipeline system near MP 28.2	Will be reviewed by local agencies prior to construction	4.8 acres construction 0.7 acres operation	0 miles	Cascade Creek	X	X	X	X	X	X
Energy Projects	(40) Old Road Solar	5 MW facility. CPCN issued January 10, 2017	Projected in-service date was October 2016. No construction to-date	18 acres	5.8 miles	No shared HUC 12 watershed	X	X				
Non-Jurisdictional Facilities associated with Southgate	(28) T-15 Dan River Interconnect and MLV 4	New interconnect to the PSNC distribution system near MP 30.4	Will be reviewed by local agencies prior to construction	5.2 acres construction 0.8 acres operation	0 miles	Town Creek – Dan River	X	X	X	X	X	X
Transportation/ Roadway Projects	(24) Berry Hill Road / VADOT	Also crossed Wolf Island Creek – Dan River HUC 10 watershed. Reconstruction of Berry Hill Road in order to accommodate more traffic- 23.7 million	Planning	Not Available	2 miles	Trotters Creek - Dan River						
Hogans Creek-Dan River HUC 10 Watershed (Caswell/**Rockingham Counties, NC and Pittsylvania County, VA)** c/												
Commercial/Industrial Projects	(50) Panaceutics Research and Development Facility / Panaceutics, Inc.	Panaceutics, a manufacturer of personalized medicine and nutrition solutions, will invest $5.8 million to establish a research and development and high-tech manufacturing facility in the Ringgold East Industrial Park in Pittsylvania County, Virginia.	Under Construction	112 acres	10 miles	No shared HUC 12 watershed	X	X				

APPENDIX F.2

Other Projects in the Geographic Scope of Analysis Considered for Cumulative Impacts

Project Type	Project ID / Project Facility a/	Description of Facilities	Temporal Status	Acres Affected b/	Approximate Distance from Southgate Project d/	Shared Watershed (Level HUC-12)	Socioeconomics/ Environmental Justice	Water Resources and Wetlands	Vegetation, Wildlife and Fisheries	Land Use, Recreation, and Visual Resources	Cultural Resources	Air Quality and Noise
Headwaters Haw River HUC 10 Watershed (Guilford/Caswell/**Rockingham/Alamance Counties, NC) c/**												
Residential Projects	(5) Carter Ridge / Keystone Homes	Carter Ridge new construction homes, Carter Ridge Drive, Reidsville, NC	Under Construction	30 acres	5 miles	Little Troublesome Creek	X	X	X			
Energy Projects	(38) Gallant Solar Farm	45 MW facility, CPCN issued March 27, 3018	Projected online June 1, 2019	276 acres	10 miles	No shared HUC 12 watershed	X	X				
Energy Projects	(49) Husky Solar, LLC	7.02 megawatt DC solar photovoltaic facility located on both sides of NC Highway 87 adjacent to Project at MP 49	In operation; Permitted prior to 2015	29 acres	0 miles	Giles Creek-Haw River	X	X	X	X	X	X
Energy Projects	(42) Osceola Solar Project	5 MW facility.	Permitted 2016. Projected in-service September 1, 2017	70 acres	1.8 miles	Town of Altamahaw – Haw River	X	X	X			
Transportation/ Roadway Projects	(22) U.S. 158 (Reidsville Road) Improvements / NCDOT	Proposed 18.8-mile widening of U.S. 158 from U.S. 421/Business 40 in Winston-Salem to U.S. 220 in Guilford County	In Development	71 acres	18.6 miles	No shared HUC 12 watershed						
Energy Projects	(39) Washington Solar Farm	5 MW solar facility. CPCN issued September 9, 2015	Projected online December 2016	30 acres	13 miles	No shared HUC 12 watershed	X	X				
Energy Projects	(37) Cypress Creek Renewables Solar Farm	174,000 MW 600 acre solar farm. Adjacent to Southgate Project at MP 50	Permitted; Construction to begin in 2019	341 acres	0 miles	Giles Creek - Haw River	X	X	X	X	X	X
Back Creek-Haw River HUC 10 Watershed (Guilford/Caswell/**Alamance Counties, NC) c/**												
Non-Jurisdictional Facilities associated with Southgate	(29) T-21 Haw River Interconnect and MLV 8	New interconnect to the PSNC distribution system and the terminus for the Southgate project	Will be reviewed by local agencies prior to construction	1.4 acres construction 0.6 acres operation	0 miles	Boyds Creek – Haw River	X	X	X	X	X	X
Energy Projects	(48) Kimery Road Solar Farm	2 MW Solar Facility	Planning	Not available	1.5 miles	Lower Back Creek	X	X	X			
Energy Projects	(43) Bakatsias Solar Farm	5 MW facility. CPCN issued November 6, 2017.	Expected in-service December 20, 2017	24 acres	7.0 miles	Lower Back Creek	X	X	X			
Residential Projects	(36) Brassfield Meadows	New construction housing development; 18 units	Under Construction	5 acres	1.7 miles	Boyds Creek – Haw River	X	X	X			
Transportation/ Roadway Projects	(17) NC 119 Relocation / NCDOT	Proposed relocation of a portion of N.C. 119 in Mebane – from I-85 to existing the N.C. 119 near Mrs. White Lane	In Development	12 acres	5 miles	Lower Back Creek						
Energy Projects	(41) Green Level-Charles Drew Solar Farm	5 MW solar energy facility	Projected online March 30, 2019	5 acres	0.9 miles	Boyds Creek – Haw River	X	X	X	X	X	X
Residential Projects	(20) LGI Homes- Bedford Hills	New construction housing development single family homes near 111 Pillow Ln., Burlington, NC	Under Construction	95 acres	1.5 miles	Lower Back Creek	X	X	X			
Residential Projects	(21) Forest Creek / True Homes	New construction housing development 5 new homes in development	Under Construction	40 acres	3.5 miles	Travis Creek – Haw River	X	X	X			
Energy Projects	(47) Necal Solar Farm	5 MW solar facility. CPCN issued November 28, 2017	Planning	42 acres	5.3 miles	No shared HUC 12 watershed	X	X	X			

APPENDIX F.2

Other Projects in the Geographic Scope of Analysis Considered for Cumulative Impacts

Project Type	Project ID / Project Facility a/	Description of Facilities	Temporal Status	Acres Affected b/	Approximate Distance from Southgate Project d/	Shared Watershed (Level HUC-12)	Socioeconomics/ Environmental Justice	Water Resources and Wetlands	Vegetation, Wildlife and Fisheries	Land Use, Recreation, and Visual Resources	Cultural Resources	Air Quality and Noise
Energy Projects	(44) Norris Solar Farm	5 MW solar facility. Application September 9, 2016. Projected in-service December 31, 2017	In service	24 acres	1.9 miles	Lower Back Creek	X	X	X			
Resource Extraction	(33) East Alamance Quarry	Gravel, sand, crushed stone aggregates operation. Owned and operated by Martin Marietta Materials, Inc.	In operation	240 acres for operation.	0.1 miles	Boyds Creek – Haw River	X	X	X	X	X	X
Residential Projects	(51) Granite Mill	Development of 176 apartments and 15,000 sq. ft. of commercial space in an abandoned mill.	Planning	6 acres	0 miles	Boyds Creek – Haw River	X	X	X	X	X	X
Big Alamance Creek HUC 10 Watershed (Guilford/**Alamance Counties, NC) c/**												
Energy Projects	(46) Woodgriff Solar	3 MW solar facility	Intent to construct permit expires June, 2019	38 acres	3.2 miles	No shared HUC 12 watershed	X	X	X			
Transportation/ Roadway Projects	(18) N.C. 62 Widening - Ramada Road to U.S. 70 / NCDOT	Proposed widening an approximately 1-mile stretch of N.C. 62 to improve traffic flow and safety	In Development	9 acres	4 miles	No shared HUC 12 watershed						
Energy Projects	(45) Southwick Solar Farm, LLC	3 MW solar facility	Application filed 2017; pending site review	26 acres	2.5 miles	No shared HUC 12 watershed	X	X				

a/ Contains ID related to projects illustrated on Figures 1 through 4.

b/ Acres affected includes the acreage of project that occurs within the watershed and not just the county shared with the Southgate Project. Acreages are estimated based on information available from various sources including the FERC eLibrary, the North Carolina Utilities Commission Website, the Virginia and North Carolina Department of Transportation websites, County websites, Bing aerials, and Google Earth imagery. Estimated acres affected are not based on final engineered project designs, as that level of detail is not available for all other projects. With the exception of the Virginia Southside Expansion project, the Transco Southeastern Trail project, and the MVP Pipeline project, acres affected by construction and operation are assumed to be the same.

c/ HUC-10 Watersheds/counties/states identified in bold indicate watersheds and counties that the Southgate Project would cross. County names that are not bolded are located within a shared HUC-10 watershed, but are not crossed by the Southgate Project.

d/ Distance estimate from Southgate Project centerline.

APPENDIX G

List of Preparers

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Cardno, Inc. is a third party contractor assisting the Commission staff in reviewing the environmental aspects of the project application and preparing the environmental documents required by NEPA. Third party contractors are selected by Commission staff and funded by project applicants. Per the procedures in 40 CFR 1506.5(c), third party contractors execute a disclosure statement specifying that they have no financial or other conflicting interest in the outcome of the project. Third party contractors are required to self-report any changes in financial situation and to refresh their disclosure statements annually. The Commission staff solely directs the scope, content, quality, and schedule of the contractor's work. The Commission 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.

APPENDIX H

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