ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Supplemental Filing
February 24, 2017

APPENDIX G-I

Study Plan for Tiger Salamander Survey in Virginia

Dominion Resources Services, Inc.
5000 Dominion Boulevard,
Glen Allen, VA 23060

February 20, 2017

BY E-MAIL

Mr. Troy Morris
USDA Forest Service
George Washington and Jefferson National Forests
5162 Valleypointe Parkway
Roanoke, VA 24019

Re: Dominion Transmission, Inc., Atlantic Coast Pipeline
Submittal of Study Plan: Eastern Tiger Salamander (*Ambystoma t. trigrinum*) Surveys along the Proposed Atlantic Coast Pipeline within George Washington National Forest in Virginia

Dear Mr. Morris:

Throughout 2014, 2015, and 2016, Atlantic Coast Pipeline (ACP) Project has been conducting routing, environmental, cultural resource, and civil surveys along the proposed pipeline route to collect information needed by Federal Energy Regulatory Commission (FERC) and other regulatory and land managing agencies to review and permit the ACP Project.

The proposed ACP facilities in Virginia fall within the range of the state-listed eastern tiger salamander. Atlantic Coast Pipeline, LLC (Atlantic) requests your review and concurrence of the attached 2017 study plan for the eastern tiger salamander surveys along the proposed Atlantic Coast Pipeline within GWNF in Virginia. This study plan describes the projected 2017 scope and methods the Project will implement to determine the extent of salamander habitat and presence along the current Project route within GWNF boundaries.

Atlantic anticipates field habitat assessments will be completed in late February and early March, and surveys will be completed in April and May, 2017. Surveys will be carried out under ESI-2's current scientific collection permits: VDGIF Scientific Collection Permit #053963 and VDGIF Threatened and Endangered Species Permit #056429 as well as the Project USFS Special Use Permit GW433202T.

Project and Company Background

Atlantic is a company formed by four major U.S. energy companies – Dominion Resources, Inc., Duke Energy Corporation, Piedmont Natural Gas Co., Inc., and Southern Gas Company. Atlantic will own and operate the proposed ACP, an approximately 600-mile-long, interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. The ACP will deliver up to 1.5 million cubic feet per day (bcf/d) of natural gas to be used to generate electricity, heat homes, and run local businesses. The underground pipeline project will facilitate cleaner air, increase reliability and security of natural gas supplies, and provide a significant economic boost in Virginia and North Carolina. For more information about the ACP, visit the company's website at www.dom.com/acpipeline. Atlantic

has contracted with DTI, a subsidiary of Dominion, to permit, build, and operate the ACP on behalf of Atlantic.

Dominion looks forward to continued coordination with you on this project. Please contact Mr. Richard B. Gangle at (804) 273-3019 or Richard.B.Gangle@dom.com, if there are questions regarding this report. Please direct written responses to:

Richard B. Gangle
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, Virginia 23060

Sincerely,

FOR RICHARD GANGLE

Robert M. Bisha
Technical Advisor, Atlantic Coast Pipeline

Cc: Richard B. Gangle, Dominion
Fred Huber, George Washington National Forest
Russ MacFarlane, George Washington National Forest
Jennifer Adams, U.S. Forest Service
Amy Ewing, VA Dep. of Game and Inland Fisheries

Attachments: Study Plan: Eastern Tiger Salamander (*Ambystoma t. trigrinum*) Surveys along the Proposed Atlantic Coast Pipeline within the George Washington National Forest in Virginia

STUDY PLAN:
EASTERN TIGER SALAMANDER (*AMBYSTOMA T. TIGRINUM*) SURVEYS ALONG THE PROPOSED ATLANTIC COAST PIPELINE PROJECT WITHIN GEORGE WASHINGTON NATIONAL FOREST IN VIRGINIA

20 February 2017

Prepared for:

Mr. Richard Gangle
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

On behalf of:

Prepared by:

Environmental Solutions & Innovations, Inc.

4525 Este Avenue
Cincinnati, Ohio 45232
Phone: (513) 451-1777
Fax: (513) 451-3321
Syracuse, NY • Stow, OH • Indianapolis, IN • Orlando, FL • Springfield, MO • Pittsburgh, PA • Teays Valley, WV

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1.0 Introduction

1.1 Project Description

Atlantic Coast Pipeline, LLC (Atlantic) is a company formed by four major U.S. energy companies – Dominion Resources, Inc., Duke Energy Corporation, Piedmont Natural Gas Co., Inc., and Southern Gas Company. Atlantic was created to develop, own, and operate the proposed Atlantic Coast Pipeline (ACP), an approximately 600 mile-long, interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina (Figure 1). The ACP will deliver up to 1.5 billion cubic feet per day (bcf/d) of natural gas to be used to generate electricity, heat homes, and run local businesses. The underground pipeline project will facilitate cleaner air, increase reliability and security of natural gas supplies, and provide a significant economic boost in Virginia and North Carolina. For more information about the ACP, visit the company's website at www.dom.com/acpipeline. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion, to permit, build, and operate the ACP on behalf of Atlantic.

Subject to receipt of the required permits and regulatory approvals, DTI anticipates construction of the Project will commence in November 2017. The ACP pipelines will be built along 12 spreads, although the number and definition of spreads may change depending on the needs of construction. Construction is scheduled to be completed over a two-year period, and all facilities will be placed in service by the end of 2019.

Environmental Solutions & Innovations, Inc. (ESI-2) was retained by Environmental Resource Management (ERM), on behalf of DTI, to conduct surveys for protected salamander species along the Project in Virginia.

1.2 Regulatory Setting

The Project is regulated by Federal Energy Regulatory Commission (FERC), an independent agency that regulates the interstate transmission of natural gas and also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines. FERC coordinates with the U.S. Fish and Wildlife Service (USFWS) and other federal and state agencies in its evaluation of the Project.

The Virginia Endangered Species Act (Va. Code §§ 29.1-563 - 29.1-570) provides that Virginia Department of Game and Inland Fisheries (VDGIF) is the state regulatory agency with authority over endangered and threatened fish and wildlife in the Commonwealth, defining fish or wildlife as "...any member of the animal kingdom, vertebrate or invertebrate, except for the class Insecta, and includes any part, products, egg, or the dead body or parts thereof."

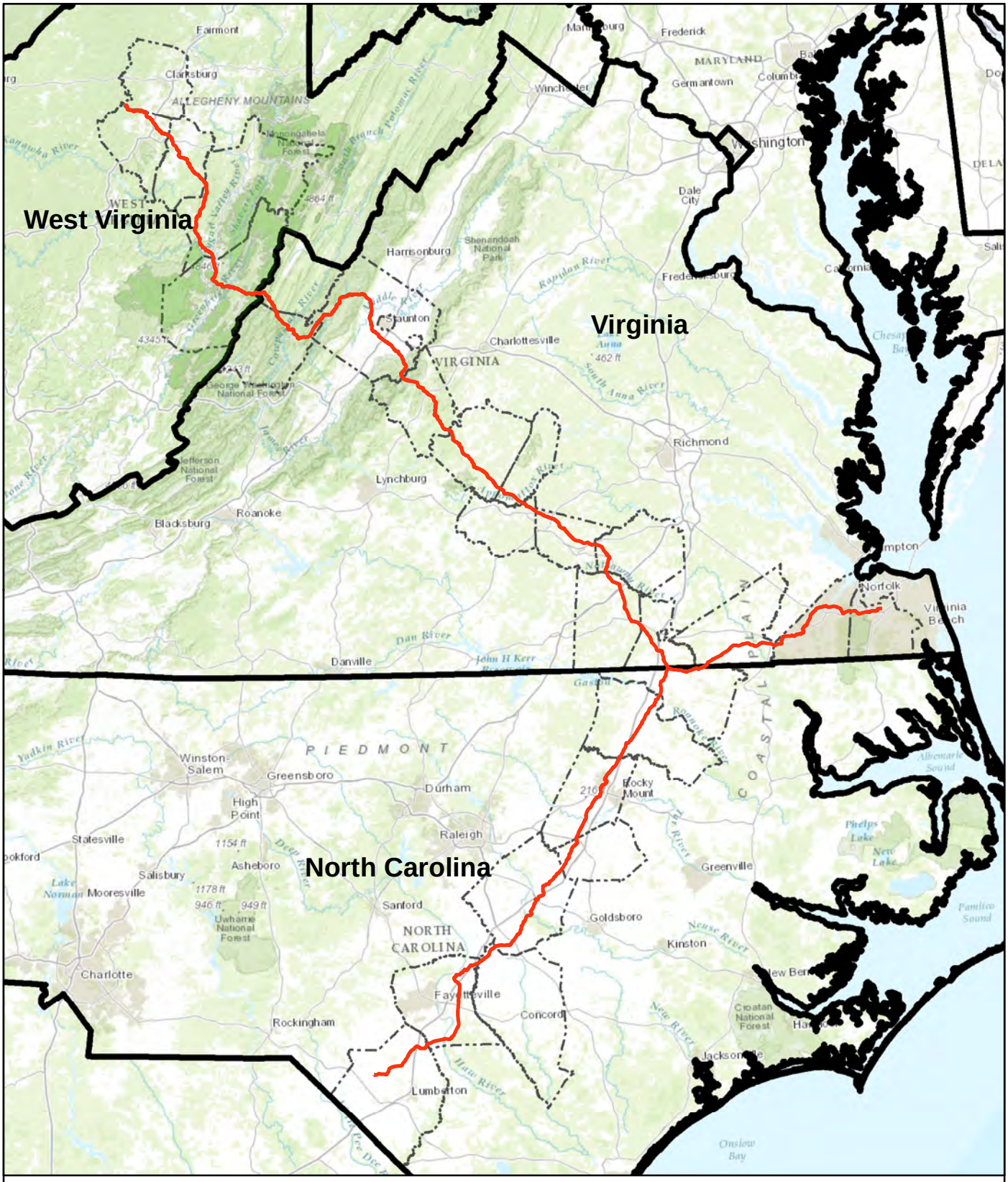

Figure 1. Proposed Atlantic Coast Pipeline Project in West Virginia, Virginia, and North Carolina.

Project No: 588.07

60 30 0 60 KM

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Path: G:\Current\588_Dominion_NRG_ACP\MXD\SalamanderTiger_and_Mabee_Salamander\2016_Report\p588_07_tiger_mabee_figure1_20160712.mxd (mbruening) - 7/12/2016

The George Washington National Forest (GWNF) will make a separate decision on whether to permit use of National Forest land for the proposed pipeline. The United States Forest Service (USFS) is participating in FERC's process as a cooperating agency and intends to rely on the FERC Environmental Impact Statement (EIS) when making its decision regarding the use of National Forest land for the proposed pipeline.

1.3 Agency Correspondence

In 2015, surveys and habitat assessments were completed for the Virginia state endangered eastern tiger salamander (*Ambystoma t. tigrinum*) in coordination with the VDGIF. In an e-mail dated 16 April 2015, the VDGIF provided initial comments and detailed recommendations regarding survey windows and counties (Augusta and Nelson) requiring survey efforts for eastern tiger salamander. Suggested survey windows included January 1 to March 31 for adults (during appropriate weather events) and April 15 to June 15 for larvae (juveniles). The agency also indicated that in-pond trapping could be conducted within these survey windows for adults (Appendix A).

Surveys completed in 2015 along a previous alignment (Rev8) identified larval eastern tiger salamanders within two wetlands in Augusta County; however, the current route no longer traverses the inhabited wetlands (ESI 2015). In addition, wetland feature waua050f in Augusta County was identified during a 2015 walkthrough survey as containing suitable habitat and received follow up trapping in 2016. This trapping survey resulted in the identification of larval eastern tiger salamanders from wetland feature waua050f; however, the current centerline (Rev12) has since been shifted approximately 30.48 meters (100 ft) from this inhabited wetland. To date, no eastern tiger salamanders have been collected along the current Project alignment on Forest Service lands.

In reviewing the 2016 survey results, the USFS commented that ACP should identify eastern tiger salamander breeding ponds (referred to within this plan as primary breeding ponds) within 1,000 feet (305 m) of the pipeline centerline within the GWNF and establish a 1,000-foot (305-m) buffer around each pond to circumscribe their terrestrial habitat, which has been shown to exclusively be, in USFS lands, mature forests within Augusta County Virginia (Church 2004). According to USFS, if there is mature forest habitat within a 1,000-foot (305-m) buffer area which intersects the pipeline, there is the potential for eastern tiger salamander terrestrial habitat to be impacted by the Project.

It was also suggested by the USFS that ACP consider secondary aquatic habitats (on both private and public lands) that have the potential to be breeding ponds linked by mature forest to the primary breeding ponds. Because of the need to include secondary aquatic habitats, all areas of USFS land traversed by the Project in Augusta, Highland, and Bath counties were added to the existing area proposed for tiger salamander assessment (Figure 2).

Figure 2 is filed under separate cover
in Appendix G-II and is marked
"Contains Privileged Information - Do Not Release".

This Study Plan is based on the current alignment (Rev12) of the Project and prepared to address comments received from the USFS specific to eastern tiger salamanders along the Project line within the GWNF in Virginia. Agency correspondence is provided in Appendix A.

Any future line revisions, additions or modifications to the Project (e.g., route changes, addition of facilities, and/or access roads) will be handled consistently with the level of effort described in this Study Plan. Should alterations to the final route occur prior to the completion of surveys, no surveys will be completed on the eliminated alignment.

Field surveys for eastern tiger salamanders will be carried out under ESI-2's current scientific collection permits: VDGIF Scientific Collection Permit #053963 and VDGIF Threatened and Endangered Species Permit #056429 as well as the Project USFS Special Use Permit GWP433202T. Appropriate agencies will be notified prior to the commencement of surveys.

2.0 Desktop Review

A detailed geographical information system (GIS – Esri ArcMap 10.3) desktop analysis was completed to identify eastern tiger salamander potential occurrences along the current Project route (Rev12). All desktop analyses are an ongoing process and are updated as new alignments or route variations occur. The Virginia Natural Heritage Database was accessed and reviewed to identify known rare salamander occurrences within the vicinity of the Project. Correspondence with VDGIF also identified approximately 15 known occurrences of the eastern tiger salamander within two counties (Augusta and Nelson).

The desktop GIS analysis was performed to identify all mature forests within 1,000 feet (305 m) of the pipeline that intersect the Project, as adult tiger salamanders are known to travel at least 900 feet (274 m) from their breeding ponds to upland habitat (Madison and Farrand 1998). Primary ponds containing breeding pond potential within this mature forest buffer were identified, along with secondary ponds connected by mature forests. This constellation of primary and secondary ponds connected by mature forests will be surveyed by field crews during the survey window, and a report will be provided to the USFS. Surveys will also include any outstanding efforts remaining resulting from previous land access denial and will incorporate the protocols requested by the USFS in 2016, as described in Section 1.3.

3.0 Methods

3.1 Habitat Assessment Walkthrough

Field habitat assessments are conducted to identify wetland features exhibiting characteristics suitable to support eastern tiger salamander breeding sites. Field surveys are carried out by professional herpetologists experienced with eastern tiger salamanders (Appendix B). Habitat assessments include a detailed evaluation of all wetlands and mature forests within a 1,000-foot (305-m) Project corridor where eastern tiger salamanders may occur. Vernal pool habitats are evaluated based on size, water clarity, emergent vegetation, the presence of predators, and surrounding habitat to determine whether salamanders are likely to migrate to and inhabit these areas for breeding purposes. Wetland features identified as containing potentially suitable habitat are surveyed to detect presence or probable absence of the species.

Once identified, significant habitat features are delineated in the field using handheld, sub-meter accurate GPS receivers. Dip net sampling is employed as part of the habitat assessment effort to increase detectability of rare salamanders and to survey small vernal pools while onsite.

3.2 Field Trapping Surveys

Field surveys are completed following survey protocol for eastern tiger salamanders in Virginia (Kleopfer et al. undated). The eastern tiger salamander breeds in winter (September – February) in intermittent and perennial ditches, vernal pools (ponds) and occasionally in stream backwaters. Field surveys target larval salamanders to reduce false negatives that commonly occur during surveys for the cryptic adult salamanders. Larval salamander survey efforts are conducted for two consecutive years within the ideal survey field season.

Surveys are completed by deploying commercial crayfish/minnow traps within a vernal pool, pond, or wetland. Traps are staked in place but not baited, as bait has been shown to have no significant increase in capture rate for salamanders (Sorensen 2002). Traps are set for five consecutive nights and checked daily.

In addition to trapping, dip nets, and fine mesh seines (0.06 – 0.28 inch [1.5 - 7mm]) may be used to detect the presence of larval salamanders. Surveys for larval eastern tiger salamanders are generally conducted at night to increase the probability of capture. Larval eastern tiger salamanders tend to hide in the detritus within deep pools and enter the water column at night to feed (Pers. comm. Kleopfer, 2015). Dip net and seine surveys are completed at a rate of 4-6 hours per acre of potential habitat.

3.3 Analysis

Upon detection of occupied habitat and/or presence of breeding habitat, a detailed analysis is completed to predict patterns of geospatial connectivity of upland forest habitats and wetland breeding habitats used by eastern tiger salamanders.

4.0 Schedule and Reporting

4.1 Field Schedule

Habitat assessment walkthrough efforts in Highland, Bath, and Augusta counties on USFS lands will be conducted in early 2017. Trapping efforts are scheduled to occur from 15 April to 15 June 2017, the VDGIF recommended time frame for larval eastern tiger salamanders surveys.

4.2 Reporting

ESI-2 will prepare a comprehensive report detailing the results of eastern tiger salamander surveys performed along the Project in 2016 and 2017, for submission to the USFS. This survey report includes a description of the regulatory setting requiring field studies, Project background information, survey method descriptions, habitat mapping data, and survey results, analysis, and discussion. The text of this report is augmented with GIS maps (where appropriate), copies of field data, and representative photographs.

5.0 Requests for Agency Concurrence

ESI-2 requests concurrence that this study plan is sufficient to assess the eastern tiger salamander and its presence along the proposed Project route (Rev 12) within GWNF lands.

6.0 Contact Information

Questions related to the Study Plan can be addressed to:

Mr. Richard Gangle
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

If Mr. Gangle is unavailable, please contact:

Ms. Sara Throndson
Environmental Resource Management
80 S 8th St.
Minneapolis, MN 55402

OR

Mr. Timothy Brust - Herpetologist
Environmental Solutions & Innovations, Inc.
8 Betty Lane
Scott Depot, WV 25560

7.0 Literature Cited

Church, D. R. 2004. Population ecology of *Ambystoma tigrinum* (caudata, ambystomatidae) and occupancy dynamics in an appalachian pond-breeding amphibian assemblage. Doctoral Dissertation, University of Virginia, Charlottesville, Virginia. 175 pp.

ESI. 2015. Mabee's salamander (*Ambystoma mabeei*) and Tiger salamander (*Ambystoma tigrinum*) surveys along the proposed Alantic Coast Pipeline in Virginia. Authors: Tim Brust and Casey Swecker. Prepared for Dominion Resources Service, Inc. By Enviromental Innovations & Solutions, Inc. Cincinnati, Ohio.

Kleopfer, J. D., A. Savitzky, J. Mitchell, and C. Hobson. Undated. Survey protocol for Mabee's salamander (*Ambystoma mabeei*) and tiger salamander (*A. tigrinum*) In Virginia. Virginia Department of Game and Inland Fisheries.

Madison, D. M. and L. Farrand, III. 1998. Habitat use during breeding and emigration in radio-implanted tiger salamanders, *Ambystoma tigrinum*. Copeia 1998:402-410.

Sorensen, K. 2002. Developing a monitoring protocol for Siren and Amphiuma in the Southeastern United States. (http://fl.biology.usgs.gov/posters/Herpetology/Sirens_and_Amphiuma/sirens_and_amphiuma.html). U.S. Department of Interior, U.S. Geological Survey, Southeast Ecological Center, Gainesville, Florida.

APPENDIX A
AGENCY CORRESPONDENCE

USDA United States Department of Agriculture | Forest Service | Monongahela National Forest | 200 Sycamore Street Elkins, WV 26241 304-636-1800

File Code: 1900; 2700
Date: August 25, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St., N.E., Room 1A
Washington, DC 20426

Dear Ms. Bose:

Subject: Forest Service Comments on the Survey Report for Virginia State-listed Salamanders on the George Washington National Forest
OEP/DG2E/Gas 4
Atlantic Coast Pipeline, LLC
Docket No. CP15-554

The Forest Service provides comments on the Virginia State-listed Salamanders submitted to the Forest Service on July 26, 2016 and filed with the Federal Energy Regulatory Commission on July 29, 2016, by Atlantic Coast Pipeline, LLC (ACP) for the proposed Atlantic Coast Pipeline Project (ACP Project). The proposed project would cross National Forest System (NFS) lands in the Monongahela National Forest and George Washington National Forest.

Specifically, the comments pertain to particular statements about the Eastern Tiger Salamander, contained in sections 3.1.2.2, *Natural History*, and 6.0, *Discussions and Conclusions,* of the report.

3.1.2.2 Natural History

1. ***The report states:*** This species breeds from December to February.

   Comment: Church (2003) found females laying eggs from September to March.

2. ***The report states:*** "The terrestrial habitat may be bottomland hardwood forest, conifer forests, or open fields (VDGIF 2015a) and include any substrate suitable for burrowing, preferably sandy areas near shallow ponds and pine savannas."

   Comment: This statement is not true for eastern tiger salamanders in the mountains of Virginia in the vicinity of the proposed ACP Project. Studies of terrestrial habitat utilization of the eastern tiger salamander on NFS lands in Augusta County, Virginia have shown that this species only uses mature forests.

In one study by a Ph.D. candidate from the University of Virginia, pitfall traps were placed surrounding three sinkholes ponds where eastern tiger salamanders breed. Using the direction from which the salamanders approached the ponds it was determined that the majority came from areas with mature forest cover (Church 2003). In concert with this study, Forest Service biologists implanted radio transmitters into eastern tiger salamanders as they exited the breeding ponds. All the radio-tracked salamanders went to areas of mature forest. In fact, when one salamander encountered a 20 year old clearcut it altered its course to remain in mature forest. One salamander in this study traveled a distance of 600 feet from the breeding pond (Huber and Kirk, unpublished research), while Madison and Farand (1998) recorded distances of over 900 feet from breeding ponds during the non-breeding season. They may travel even farther. Any conservation/mitigation activities for this species, or any pond breeding amphibian, must include not only the breeding pond itself, but also the surrounding terrestrial habitat where the animals spend most of their lives. A buffer of at least 1,000 feet from the edge of breeding ponds is recommended.

6.0 Discussion and Conclusions

3. ***The report states:*** Of three potentially suitable habitat areas identified for Tiger Salamanders in Augusta County, one site is ranked as high and two are moderate. Surveys completed at one Site (waua050f) yielded collection of a single larval Tiger Salamander. Additional Pesi 588.07 surveys should be completed on a total of four sites in Augusta County during the next appropriate survey season (2017) as landowner permission to access some areas was not granted for the 2016 sampling season.

Comment: We concur that further field work is important to determine the presence or absence of eastern tiger salamanders in any sinkhole ponds and surrounding habitat that might be affected by the proposed pipeline. It is important to keep in mind that metapopulation dynamics are extremely important for this species. The breeding habitat can be variable from year to year and this, along with the loss of wetland habitats in the area, means that all natural sinkhole ponds in the area are important. Some of the ponds may produce viable salamander offspring in most years. Other ponds may rarely produce offspring, but when they do, it can be a great benefit to the population as a whole and may be essential in keeping populations viable. This interconnectedness of the ponds in the area of the proposed pipeline, both on Forest Service land and on private land, must be taken into account as the effects to ponds on private land may affect eastern tiger salamander populations on Forest Service land and vice versa.

Literature Cited

Church, D. 2003. Population Ecology of *Ambystoma tigrinum tigrinum* and Occupancy Dynamics of an Appalachian Pond-breeding Amphibian Assemblage. A Dissertation Presented to the Graduate Faculty at the University of Virginia in Candidacy for the Degree of Doctor of Philosophy. University of Virginia, Charlottesville, VA.

Madison, D. M. and L. Farand III. 1998. Habitat use during breeding and emigration in radio-implanted tiger salamanders, *Ambystoma tigrinum.* Copeia 1998:402-410.

For questions, please contact Jennifer Adams, Special Project Coordinator, at (540) 265-5114 or by email at jenniferpadams@fs.fed.us.

Sincerely,

CLYDE THOMPSON
Forest Supervisor

cc: Atlantic Coast Pipeline, LLC

From: Ewing, Amy (DGIF) [mailto:Amy.Ewing@dgif.virginia.gov]
Sent: Thursday, April 16, 2015 12:53 PM
To: Sara Throndson
Cc: Kleopfer, John (DGIF)
Subject: salamanders along the ACP - ESSLog# 34825

Hi Sara,
JD and I have reviewed our data records and discussed further where we believe you need to concentrate your efforts related to protection of eastern tiger salamanders and Mabee's salamanders. We offer the following input:

We recommend that you perform an habitat assessment for eastern tiger salamanders within your proposed disturbance corridor in Nelson and Augusta Counties. The assessment report should be provide to me and JD for review and concurrence. If, during that assessment, areas of suitable habitat are located, those areas will need to be surveyed to determine presence or absence or presence will need to be assumed and the resources protected from impact. If that cannot be done, we will need to determine how impacts can be minimized or mitigated, as necessary.

We recommend that you perform an habitat assessment for Mabee's salamanders within your proposed disturbance corridor in the city of Suffolk. The assessment report should be provide to me and JD for review and concurrence. If, during that assessment, areas of suitable habitat are located, those areas will need to be surveyed to determine presence or absence or presence will need to be assumed and the resources protected from impact. If that cannot be done, we will need to determine how impacts can be minimized or mitigated, as necessary.

Per JD, "surveys for adults salamanders for either species should be conducted between January 1 and March 31 during appropriate weather events. In-pond trapping could also be conducted simultaneously during this time period. Surveys for larvae of either species should be conducted between April 15th and June 15th. Timing is dependent on weather conditions. The month of May would be the preferred month for conducting larvae surveys."

Depending on timelines and funding, you may choose to perform surveys prior to our review of your habitat suitability assessment. We are agreeable to that, as long as the necessary permits have been acquired and as long as you understand that we may or may not agree with the results of your assessment.

Get in tough if you need anything further.

Thanks, Amy

Amy Ewing ☯ **Environmental Services Biologist/FWIS Manager** ☯ **VA Dept. of Game and Inland Fisheries** ☯ **4010 West Broad St. Richmond, VA 23230** ☯ **804-367-2211**
☯ **www.dgif.virginia.gov**

APPENDIX B
KEY STAFF RESUMES

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
Résumé
Timothy J. Brust

EDUCATION

M.S., Biology/Herpetology, Marshall University, 2013
Master's Thesis: *The Dietary Preference of the Queen Snake* (*Regina septemvittata*)
B.S., Biology, concentration in Ecology, Virginia Military Institute, 2011

CERTIFICATIONS AND TRAINING

OSHA 10 Hour General Industry Safety Certification
PADI Open Water Diver Certification
Ohio Boater Education Certificate

QUALIFICATIONS AND EXPERIENCE

Mr. Brust assists with a variety of wildlife research and management activities including: fish, crayfish, aquatic invertebrates, mammals and herpetological surveys. He is familiar with various protocols, field collection techniques, species handling, morphometric processing and identification, and data entry and analysis. Mr. Brust's field experience includes:

- Herpetology studies using drift fences, cover boards, funnel traps, hoop traps, dip netting, road search, palpation and eye shine. He is experienced handling venomous snakes including pit vipers, vipers and elapids and handling crocodilians, including the endangered American crocodile, American alligator, and spectacled caiman. His experience also includes habitat assessments and surveys for a variety of salamanders including the federally listed Cheat Mountain salamander.
- Ichthyology studies using electrofishing equipment and techniques (backpack units and boat shocking), hauling, loading, unloading, and driving boats, equipment set up and tear down
- Mammology studies using mist nets for bats and Sherman trap lines for small mammals, morphometric processing and data entry.
- Astacology studies using crayfish field collecting techniques.

Mr. Brust's professional field experience predominantly focuses on herpetology, specifically snakes and salamanders. He is an active member of the herpetological scientific community and currently involved in organizing and establishing a new Ohio chapter in the midwest region of Partners for Amphibian and Reptile Conservation (PARC).

PROJECT EXPERIENCE

Field Supervisor – Dominion, Atlantic Coast Pipeline: 2015-2016. Completed herpetological surveys along portions of a 554-mile long natural gas transmission mainline and associated laterals in West Virginia and Virginia. Assessed habitat for potential breeding areas and conducted field surveys for state-listed eastern tiger and Mabee's salamander in Virginia. Led trapping efforts in suitable habitat areas and successfully trapped 33 juvenile tiger salamanders. Completed surveys for federally listed Cheat Mountain salamander in West Virginia. Surveys were completed by turning over natural cover objects or walking trails on rainy nights and yielded two individuals. Additionally, contributed to surveys for green salamander, Roanoke logperch, freshwater mussels, and Neuse River waterdog. To date, captured 42 Neuse River waterdogs.

Biologist – EQT, Mountain Valley Pipeline: 2015-2016. Participated in surveys for multiple terrestrial and aquatic species along a 300-mile long natural gas pipeline traversing twelve counties in West Virginia and six counties in Virginia. Tasks included freshwater mussel habitat assessments and field surveys, bat mist netting and radio telemetry, and bog turtle habitat assessments and field surveys.

Biologist – Spectra Energy, NEXUS Gas Transmission: 2015-2016. Completed desktop habitat assessment and presence/absence field surveys for the eastern Massasauga rattlesnake along portions of proposed 250-mile, 36-inch diameter natural gas transmission pipeline originating in Columbia County, Ohio and extending through Ohio to Wayne County, Michigan. Additionally, contributed to freshwater mussel surveys.

Field Supervisor – Northern Indiana Commuter Transportation District, South Shore Line Double Track Initiative**:** 2016. Assisted Dr. Jennifer W. Moore and completed pedestrian surveys for eastern Massasaugas, spotted turtles, Kirtland's snakes, and northern leopard frogs along a 22-mile stretch of railroad along the Calumet Trail in Porter County Indiana. No reptiles or amphibians were encountered.

Field Supervisor – Columbia Gas, WB XPress Pipeline: 2016. Completed Timber Rattlesnake survey along existing pipeline right-of-way in in the Monongahela National Forest in Randolph and Pendleton counties, West Virginia. Thirteen timber rattlesnakes and two northern copperheads were observed.

Biologist – Rice Energy, Raider to Dr. Awkward Pipeline: 2016. Completed habitat assessment for eastern hellbender at proposed pipeline crossing of North Fork Captina Creek in Belmont County, Ohio.

Biologist – Strike Force East, Marauder Phase II Pipeline: 2016. Completed habitat scoping to determine the presence of suitable habitat for freshwater mussels and eastern hellbenders along Captina Creek in Belmont County, Ohio.

Biologist – Spectra/Texas Eastern Transmission, Ohio Pipeline Energy Network: 2016. Completed occupancy survey for hellbenders along portions of 75.8-mile natural gas pipeline in Ohio.

Biologist – Confidential Client, Emergency Response: 2016. Participated in Phase II freshwater mussel survey within the Markland Pool of the Ohio River. Project was warranted by an inadvertent discharge of diesel fuel and encompassed over 10.3 miles of underwater transect surveys. It is the largest, contiguous, and standardized mussel survey known to occur in the Ohio River.

Biologist – Ohio Department of Transportation, HEN-109 Bridge Replacement: 2016. Completed freshwater mussel surveys and relocation efforts on the Maumee River in Henry County, Ohio.

Biologist – Ohio Department of Transportation, Bank Stabilization: 2016. Completed freshwater mussel surveys within the Racine Navigational Pool of the Ohio River in Meigs County, Ohio and Jackson County, West Virginia.

Biologist – Eckart-America Corporation, Streambank Stabilization: 2016. Completed freshwater mussel relocation efforts along the Grand River in Lake County, Ohio.

Biologist – Dominion Transmission, Bank Stabilization: 2016. Completed freshwater mussel Phase I and Phase II surveys and relocations along South Fork Fishing Creek in Wetzel County, West Virginia.

Biologist – Ergon, Barge Mooring Structures Installation and Bank Stabilization: 2016. Completed freshwater mussel relocation efforts along the Ohio River in Washington County, Ohio.

Biologist – Columbia Gas Transmission, WB Xpress: 2015. Completed walkthrough habitat assessment and field surveys for the federally threatened Cheat Mountain salamander along portions of a 28.7-mile natural gas transmission project in West Virginia. Nine Cheat Mountain salamanders were observed during occupancy surveys.

Biologist – Confidential Client, Recreational Boat Dock: 2015: Completed federally endangered freshwater mussel surveys for proposed recreational boat dock along the Allegheny River in the City of Pittsburgh in Allegheny County, Pennsylvania.

Biologist – StatOil, Surface Water Intake: 2015. Completed freshwater mussel surveys for on Sunfish Creek approximately 0.6 mile from its confluence with the Ohio River in Monroe County, Ohio.

Biologist – Clarion Midstream, Project Entropy: 2015. Completed freshwater mussel surveys at the crossing of the Allegheny River in Clarion County, Pennsylvania for a proposed natural gas pipeline. Survey resulted in the capture of 134 live individuals of eight species include the federally endangered northern riffleshell, clubshell and rayed bean.

Biologist – EQT / EQM Midstream OPCO, MOSA D002, MOSA D003, and MOSA S036 Pipelines: 2015. Completed freshwater mussel surveys and relocations at seven crossings of Arnold Creek in Doddridge County, West Virginia for various natural gas pipeline projects.

Biologist – Dominion, Supply Header Project: 2015. Completed freshwater mussel surveys at three crossings of South Fork Fishing Creek in Wetzel County, West Virginia

and one crossing of McElroy Creek in Doddridge County, West Virginia of a proposed 36.7-mile natural gas pipeline loop.

Biologist – Confidential Client: 2014 – 2015. Assisted with the implementation of a conservation program for the American crocodile (*Crocodylus acutus*) in southern Florida. Conducted hatchling and nest surveys and general population surveys.

Biologist – University of Florida: 2014 – 2015. Volunteer for the Everglades Invasive Reptiles and Amphibian Monitoring Program (EIRAMP) in Everglades National Park. Detected and removed invasive reptiles, as well as established densities of native reptiles, amphibians and mammals.

Biologist – Confidential Client: 2012 – 2013. Assisted with fish population surveys on multiple rivers in West Virginia. Collected tissue samples and conducted seining and electrofishing.

Research Assistant – Confidential Client: 2009 – 2010. Assisted with surveys to locate roosting habitat for the eastern small-footed bat (*Myotis leibeii*) in southern New Hampshire. Assisted with mist net set up, species identification, morphometric processing and radio-telemetry studies.

PUBLICATIONS

Hawes, M.E., T. J. Brust. 2009. Roosting habits of male eastern small-footed bats (*Myotis lebeii*) in New Hampshire. New Horizons 4:97-102.

PRESENTATIONS

Roosting Habits of Male Eastern Small-Footed Bats (*Myotis lebeii*) in New Hampshire. Timothy Brust. Eastern Bat Working Group Meeting and Mammal Colloquium. Louisville, KY. Presented 2011.

ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.
Résumé
Sarah J. Messer

CERTIFICATIONS AND TRAINING

Method 9 and Method 22
Wetland Delineation
8-Hour SafeLand USA Basic Orientation, 2016
NCTC Wetland Plant Identification, 2014
Swamp School for Wetland Delineation, 2013
Benthic Macroinvertebrate Surveying and Rapid Bioassessment Protocol Methods (WVDEP), 2012
West Virginia Division of Natural Resources Fish Identification

QUALIFICATIONS AND EXPERIENCE

Ms. Messer participates in a variety of aquatic and terrestrial wildlife projects and research in the eastern, mid-western, and southern U.S. Her field experience, serving as assistant or team leader, includes surveys focused on amphibians, reptiles, mussels, fish, and benthic macroinvertebrates. Her experience, both professionally (under supervision of permitted biologists) and on her own time, includes surveys for numerous federal and state listed species such as: eastern massasauga and timber rattlesnakes; corn snake; wood turtle; Argentinian tegu; Neuse River waterdog; hellbenders; Cheat Mountain, Mabee's, tiger, and green salamanders; American alligator; and American crocodile.

In addition to wildlife surveys, Ms. Messer completes water sampling for toxicity testing and compliance, stormwater compliance, sanitary system compliance, water sampling for mercury, opacity testing, and data collection. She also completes stream/wetland delinieations, permitting, and mitigation associated with Marcellus Shale oil and gas production.

She is familiar with species handling, morphometric processing, field photography, and data entry and analysis, and is proficient with the following field techniques and equipment:

- Biological studies and sampling
- Fish surveys using backpack electro-shockers for sampling smaller streams, bank shockers for moderate size streams, and tote barge for sampling larger streams and small rivers.
- Surface water sampling
- Benthic sampling using kick-net and dip-net
- Method 9 and Method 22 measures for pollutants, dust haze, or smoke
- HGM High Gradient Stream Surveys
- Stream/wetland delineation, permitting, and mitigation

PROJECT EXPERIENCE

Team Leader – Columbia Gas Transmission, Line WB-3 Integrity Pipeline: 2016. Completed Cheat Mountain salamander habitat assessment along portions of a natural gas transmission line in Tucker County, West Virginia.

Field Assistant – Ohio Department of Transportation, HEN-109 Bridge Replacement: 2016. Assisted with mussel relocations for bridge demolition and replacement on Maumee River in Henry County, Ohio.

Field Assistant – Koppers, Maintenance Dredging: 2016. Assisted with survey for federally endangered Roanoke logperch on the Roanoke River in Salem, Virginia.

Field Assistant – Dominion, Atlantic Coast Pipeline: 2016: Completed mist net survey, portal search, and harp trapping for listed bat species along portions of 554-mile natural gas pipeline in Virginia and West Virginia.

Field Assistant – American Electric Power, Multiple Transmission Lines: 2016. Completed summer mist netting for listed bat species in West Virginia.

Field Assistant – American Electric Power, Hanging Rock Transmission Line Rebuild: 2016. Performed habitat walkthrough for listed bat species in Lawrence and Scioto counties, Ohio.

Field Assistant – EQT/ EQM Gathering OPCO, F1146 Pipeline Replacement: 2016. Completed emergency wetland determination for pipeline replacement in Gilmer County, West Virginia.

Field Assistant – Eclipse Resources, Craig Miller Well Pad: 2016. Assisted with aquatic resources delineation for proposed well pad in Monroe County, Ohio

Team Leader – Spectra Energy, NEXUS Gas Transmission: 2015-2016. Team Lead on field surveys for eastern massasauga rattlesnake along portions of proposed 250-mile natural gas transmission pipeline originating in Columbia County, Ohio and extending through Ohio to Wayne County, Michigan.

Field Assistant – Dominion, Atlantic Coast Pipeline: 2015-2016 Completed field surveys along portions of 554-mile natural gas transmission mainline and associated laterals in West Virginia and Virginia. Surveys focused on freshwater mussels; Neuse River waterdogs; Roanoke logperch; Carolina madtom; spiny crayfish; and tiger, Mabee's, green, and Cheat Mountain salamanders. Additionally, completed surveys for fish and butterflies and moths on George Washington National Forest.

Field Assistant – MVP, Mountain Valley Pipeline: 2015-2016. Participated in surveys for multiple terrestrial and aquatic species along portions of 300-mile natural gas pipeline traversing twelve counties in West Virginia and six counties in Virginia. Surveys focused on freshwater mussels, bog turtles, birds, plants, and listed bat species.

Field Assistant – Columbia Gas Transmission, WB Xpress: 2015-2016. Completed walkthrough habitat assessment and field surveys for the federally threatened Cheat Mountain salamander along portions of a 28.7-mile natural gas pipeline in Randolph and Pendleton counties, West Virginia. Nine Cheat Mountain salamanders were observed during occupancy surveys.

Field Assistant – EQT / EQM Midstream OPCO, MOSA D002, MOSA D003, and MOSA S036 Pipelines: 2015. Completed freshwater mussel surveys and relocations at seven crossings of Arnold Creek in Doddridge County, West Virginia for multiple natural gas pipelines.

Field Assistant – JKLM Energy, Goodwin Quarry Freshwater Impoundment: 2015. Completed surveys for aquatic invasive species at freshwater impoundment in the Allegheny River floodplain of Potter County, Pennsylvania.

Field Assistant – StatOil, Surface Water Intake: 2015. Completed freshwater mussel survey and relocations on Sunfish Creek approximately 0.6 mile from its confluence with the Ohio River in Monroe County, Ohio. Because of zero underwater visibility conditions, mussel survey was completed via tactile searches.

Field Assistant – Energy Transfer, Revolution Pipeline: 2015. Completed aquatic resource screening for proposed 40-mile, 30-inch diameter pipeline in Butler, Beaver, Allegheny, and Washington counties, Pennsylvania. Identified and delineated 178 wetlands, 338 streams, and 9 ponds.

Field Assistant – Eureka Hunter Pipeline, Stalder Pipeline: 2015. Completed aquatic resource delineations in Monroe County, Ohio.

Field Assistant – Eureka Hunter Pipeline, Moser Pipeline: 2015. Completed aquatic resource delineations Monroe County, Ohio.

Field Assistant – Eureka Hunter Pipeline, Pyles-Miller-Pitman Pipeline: 2015. Completed aquatic resource delineations in Monroe County, Ohio.

Team Leader – Confidential Clients, Field Studies: 2006-2015. Completed multiple biological studies and sampling involving fish and bethic macroinvertebrates. Also performed water sampling, stream/wetland delineation, permitting, and mitigation, regulated and permit compliance for various coal, quarries, and oil and gas facilities using Method 9 and Method 22, and High Gradient Stream Surveys (a relatively new protocol developed by the U.S. Army Corps of Engineers for quantifying the condition of ephemeral or intermittent headwater streams)