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Supplemental Direct Testimony, Schedules and Exhibits of Virginia Electric and Power Company

Before the State Corporation Commission of Virginia

Line #65 115 kV Rebuild at Norris Bridge

Application No. 276

Case No. PUE-2016-00021

Filed: October 31, 2016

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WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Wesley D. Keck

Title: Project Manager III – Dominion Technical Solutions

Summary:

Company Witness Wesley D. Keck summarizes the Company's study results regarding Barnhardt Options 1 and 2 and provides an update on the Company's communications with VDOT related to the Rebuild Project.

Mr. Keck testifies that the results of the Company's additional study, which are supported by various Company witnesses, reaffirm that the Proposed 115 kV Overhead Route best meets the identified need for the Rebuild Project at the lowest cost, while also resolving the reliability and operational issues related to the bridge line attachment and reasonably minimizing adverse impact to the scenic assets, historic districts and the environment of the area concerned.

Comparing Barnhardt Option 1 to the Company's Overhead Alternatives, Mr. Keck states that Barnhardt Option 1 only compares favorably as to environmental impacts. But in terms of the ability to meet the identified need, the cost and operational impacts, the Company's Overhead Alternatives are far superior to Barnhardt Option 1.

Mr. Keck testifies that if the Commission were to approve an underground route, the study results demonstrate that the Company's Underground Option is less costly, with fewer operational and environmental impacts than Barnhardt Option 2.

Mr. Keck next details communications between the Company and VDOT beginning in the summer of 2014 through, most recently, a meeting between Dominion Virginia Power, Power Delivery Consultants, and VDOT representatives on October 3, 2016. Mr. Keck states that the Company has sent a letter to VDOT, which provides detailed conceptual engineering and requests VDOT's input regarding a variety of topics relevant to this proceeding. He notes that the Company requested a response from VDOT by the end of November and will file any response received with the Commission.

SUPPLEMENTAL DIRECT TESTIMONY
OF
WESLEY D. KECK
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment with Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company"), and business address.

A. My name is Wesley D. Keck, and I am a Project Manager III – Dominion Technical Solutions. My business address is 701 East Cary Street, Richmond, Virginia 23219.

Q. Have you previously submitted testimony in this proceeding?

A. No, I have not.

Q. What is your educational and professional background?

A. I graduated from West Virginia University in 1980 with a Bachelor of Science degree in Civil Engineering. I am a licensed Professional Engineer, registered in VA and NC. I have been with the Company in a variety of positions for over 35 years. From 2001 to 2007, I worked as a Facilities Manager, and from 2007 to 2014, I worked as a Manager of Electric Distribution, Network, for Dominion Resources, Inc. I was promoted to my current position of Project Manager III for Dominion Virginia Power in April 2014.

Q. Please describe your areas of responsibility with the Company.

A. The role of the Project Manager is to take a Conceptual Phase Request from the Planning Department, and identify the scope and objectives of the project. I then assemble and lead the team to permit, design, construct and energize the project safely, on schedule and within budget. I have been involved with this current project since it was assigned to me

in May of 2014.

Q. What is the purpose of your supplemental direct testimony?

A. The purpose of my supplemental direct testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016 ("July 22nd Ruling"), which directed the Company to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii) installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow depths adjacent to the banks ("Barnhardt Option 2").

Specifically, I will summarize the Company's study results regarding Barnhardt Options 1 and 2 and also provide an update on the Company's communications with the Virginia Department of Transportation ("VDOT") related to the Company's proposal to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9-mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project"). The Company's proposal included constructing 10 galvanized steel H-frame structures in the water approximately 100 feet east of the Norris Bridge ("Proposed 115 kV Overhead Route").

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes. Company Exhibit No. __, WDK, consisting of Supplemental Direct Schedule 1, was prepared under my direction and supervision, and is accurate and complete to the best of my knowledge and belief.

Q. Before you begin, please describe how your supplemental direct testimony is organized.

A. My testimony is organized in the following sections:

I. Summary of Additional Study Results

II. Communications with VDOT

I. SUMMARY OF ADDITIONAL STUDY RESULTS

Q. Please generally describe Barnhardt Options 1 and 2 as they have been studied further in accordance with the Hearing Examiner's July 22nd Ruling.

A. The scope and detailed descriptions of Barnhardt Options 1 and 2 were developed by the project team and I will generally describe them. Barnhardt Option 1 would involve the replacement and relocation of a section of Line #65 that parallels Route 3 and crosses the Rappahannock River with new cables entirely attached to the Norris Bridge, until the transition to land at the north and south bridge abutments; however, at approximately 2.3 miles, this option would be slightly longer than the Company's Proposed 115 kV Overhead Route and 230 kV Overhead Alternative (collectively, the "Overhead Alternatives"). This option would replace approximately 2.3 miles of Line #65 with primarily above ground construction attached to the Norris Bridge. The route generally follows along the centerline of the Proposed 115 kV Overhead Route until crossing Norris Bridge, utilizing approximately 0.45 mile of land in Lancaster and Middlesex Counties, and 1.86 miles over the Rappahannock River on the Norris Bridge. This option would involve the placement of seven cables (two cables per phase with one spare) within approximately 1,100 feet of concrete-encased duct bank on the south shore and 1,200 feet of concrete-encased duct bank on the north shore. The remaining

approximately 10,000 feet of cable will be installed within eight separate 8-inch-diameter fiberglass conduits (seven will contain cable and one will be a spare) attached to the underside of the bridge. In addition, two 4-inch-diameter fiberglass conduits will also be included to contain ground conductors and fiber optic cables. Where the conduits reach the ends of the bridge, they would curve to the east of the bridge and turn downward to enter the ground. At this point, the cables would transition from the conduit into the concrete-encased duct bank described above. Barnhardt Option 1 would require the same transition stations as the underground option that the Company presented for the Commission's consideration in the application (the "Underground Option").

Barnhardt Option 2 involves the replacement and relocation of a section of Line #65 that parallels Route 3 and crosses the Rappahannock River with new cables trenched into the bottom of the Rappahannock River; however, at approximately 2.4 miles, this option would be the longest of all the alternatives. This option would replace approximately 2.3 miles of existing Line #65 with 2.4 miles of new underground and overhead construction generally following along the centerline of the Overhead Alternatives route on land, utilizing approximately 0.4 mile of land in Lancaster and Middlesex Counties, and approximately 2.0 miles under the Rappahannock River. This option would involve the placement of seven cables within 800 feet of concrete duct bank on each shore. At the end of the duct bank, the land cables would enter manholes where they would be spliced to submarine cables. These manholes would measure 10 feet in width, 28 feet in length, and 8 feet in depth. At the on-land splice locations, the seven submarine cables would enter into seven conduits. The conduits, installed via horizontal directional drill ("HDD") construction method, would extend below the riverbed and would surface on the river

bottom between 1,308 and 1,781 feet from shore on the south side and between 910 and 1,400 feet from the top of bank on the north side. The use of conduit in these locations would avoid direct disturbance to existing oyster leases. In the river, between the south- and north-side conduits, the submarine cables would be installed in seven trenches excavated into the river bottom using water jet plow technology. These seven trenches for the submarine cables would vary in length between 7,500 and 8,100 feet long. Barnhardt Option 2 would also require the same transition stations described for the Underground Option.

Q. Based on further study of Barnhardt Options 1 and 2 on the bases of meeting the identified need for the project, cost, operational impacts and environmental impacts, does the Company still support the Proposed 115 kV Overhead Route for the Rebuild Project?

A. Yes, we do. In fact, the results of the Company's additional study, which are supported by various Company witnesses, reaffirm that the Proposed 115 kV Overhead Route best meets the identified need for the Rebuild Project at the lowest cost, while also resolving the reliability and operational issues related to the bridge line attachment and reasonably minimizing adverse impact to the scenic assets, historic districts and the environment of the area concerned.

Q. As to the overhead options, how does Barnhardt Option 1 compare to the Company's Overhead Alternatives?

A. Barnhardt Option 1 only compares favorably to the Overhead Alternatives as it relates to environmental impacts in that, as explained by Company Witness Jon M. Berkin, it does not require new right-of-way in the river. In terms of its ability to meet the identified

need, the cost and operational impacts, the Company's Overhead Alternatives are far superior to Barnhardt Option 1.

Most importantly, Company Witness Dennis D. Kaminsky explains that Barnhardt Option 1 does not resolve the identified need for the Rebuild Project and would result in violations of mandatory North American Reliability Corporation ("NERC") Reliability Standards. Therefore, Barnhardt Option 1 should not be considered further by the Commission because it does not resolve the identified need for the Rebuild Project.

Q. How does Barnhardt Option 2 compare to the Company's Underground Option?

A. If the Commission were to approve an underground route, the study results demonstrate that the Company's Underground Option is less costly, with fewer operational and environmental impacts than Barnhardt Option 2.

Q. Can you please summarize the costs, operational impacts and environmental impacts of Barnhardt Options 1 and 2 as compared to those routes already offered for consideration by the Company?

A. Yes. Based on the additional study conducted by the Company and its consultants, I present Table 1, below, to summarize at a high level certain considerations related to these routes.

Table 1

Option/Alternative	Cost	Meets Need and Solves NERC Reliability Violations?
Proposed 115 kV Overhead Route	$26.2 million	Yes
230 kV Overhead Alternative	$26.3 million	Yes
Underground Option	$83.6 million	Yes
Barnhardt Option 1	$35.0 million*	No
Barnhardt Option 2	$92.3 million	Yes
*Excludes potential cost of bridge enhancements required by VDOT		

Barnhardt Option 1 may require additional costs of bridge enhancements required by VDOT that I discuss in more detail below.

Company Witnesses Donald E. Koonce and Kaminsky address operational impacts associated with these options and alternatives.

As to environmental impacts, the supplemental alternatives analysis sponsored by Company Witnesses Berkin and Benjamin W. Sussman of ERM supports the conclusion that either of the Overhead Alternatives are preferable to the Underground Option and Barnhardt Option 2.

In short, the Company believes that the Proposed 115 kV Overhead Route is the least costly and most robust solution that meets all aspects of the identified need and reasonably minimizes adverse impact to the scenic assets, historic districts and the environment of the area concerned.

II. COMMUNICATIONS WITH VDOT

Q. Turning to VDOT, what is that agency's involvement and role in the Rebuild Project?

A. The current configuration of Line #65 as it crosses the Rappahannock River is attached via davit style arms to the Norris Bridge, which is under the control of VDOT. Accordingly, one of the first steps I took as Project Manager was to identify the appropriate VDOT contacts, which were at the time Greg Henion (Fredericksburg District Construct Engineer) and Annette Adams (Fredericksburg District Bridge Engineer).

I had several conversations with Mr. Henion and Ms. Adams in the summer of 2014 regarding the Rebuild Project. During those conversations, I provided a high level overview of the Rebuild Project and its timeline. We also shared our mutual concerns regarding current and future bridge maintenance and how that could impact operation of the transmission line on the bridge. We discussed lane closure issues, outage requirements, and prior financial implications that had arisen when the line is in a planned outage for VDOT maintenance and needs to be put back in-service by the Company due to serious storms.

In August of 2014, I called Ms. Adams to discuss in more detail the Company's proposed solution of constructing overhead H-frame structures in the water. I further noted the Company's preference would be to stay east of the Norris Bridge. I asked if staying 100-feet downriver would be expected to create any future conflicts with bridge reconstruction. At that time, Ms. Adams indicated VDOT would be planning a new bridge at its current location or upriver (west) of the current bridge, so VDOT verified

that locating the transmission line 100-feet downriver would not pose any issues.

Q. Was VDOT involved in any of the community outreach regarding the Rebuild Project?

A. On August 25, 2015, Dominion Virginia Power and VDOT were both invited to the Tides Inn for a meeting hosted by Lancaster County to discuss our Rebuild Project. Mr. Henion from VDOT attended this meeting but did not make any formal presentations. The Company presented a project overview and update on the status of the Rebuild Project and its timeline. During the presentation, several individuals in the audience challenged the Company's statements regarding bridge lane closure issues, and planned and unplanned outages. Mr. Henion provided support for the Company's statements and provided specific examples of lane closures. He also confirmed that during a prior painting project, VDOT requested the line be taken out of service, and that the Company had to temporarily stop the painting and re-energize the line when it was needed due to a hurricane threat.

The Company continued to update VDOT regarding the status of the Rebuild Project during the injunction hearing and application made in this proceeding. VDOT provided two letters, dated February 19, 2016 and February 26, 2016, which were included as Attachment I.C.3 and Attachment I.C.4 (pp. 90-93) in the Appendix to the Company's application for approval of the Rebuild Project.

Q. What other contact has transpired between the Company and VDOT since that time?

A. On November 2, 2015, several Company employees and I were invited to the

Fredericksburg VDOT office to discuss the remaining painting of the bridge that needed to be done and to discuss the outage requirements. That meeting also included a Rebuild Project update.

Specifically regarding the outage requests, VDOT had two requests to de-energize the portion of Line #65 on the Norris Bridge:

- TOA 16-00264: 9/20/2016 to 12/9/2018 – covers VDOT's request for bridge painting and includes an emergency restoration time of two days for which Dominion Virginia Power will contact VDOT directly; and
- TOA 16-04806: 10/3/2016 to 11/2/2016 – covers the engineering request for the annual bridge inspection.

Q. When did you begin discussing Barnhardt Option 1 with VDOT?

A. The Company provided a high level evaluation of attaching conductors to the bridge when we were developing alternatives (described as the 115 kV Bridge Attachment Option in Section I.C of the Appendix). Initially, we believed that this option would add well over one million pounds of cable and steel to the bridge. Based on prior communications with VDOT regarding their desire to not add new dead load to the bridge, the Company rejected this option.

Since the Hearing Examiner's July 22nd Ruling directing that we investigate this option in more detail, there has been discussion between the Company, Power Delivery Consultants ("PDC") and VDOT regarding some of the technical requirements associated with Barnhardt Option 1 and the Company's approach and needs for addressing the attachment of insulated cables to the existing Norris Bridge.

We met with VDOT on August 18, 2016. After providing case background, Mr. Koonce of PDC presented conceptual configurations of cable attachments along with actual pictures of the bridge and drawings to offer options on how to best accomplish the crossing.

On August 19, 2016, I provided a PowerPoint presentation to Ms. Adams demonstrating that the preliminary expected load increase to the bridge as a result of Barnhardt Option 1 was approximately 156 pounds/foot. This number has since been revised upward to approximately 183 pounds/foot (a total added weight to the bridge approaching two million pounds), as reflected in the PDC Report sponsored in the supplemental direct testimony of Company Witness Koonce.

On August 31, 2016, we provided further information regarding cable weight, reel weight, and weights for the construction equipment that would need to be on the bridge during installation.

Also on August 31, Ms. Adams indicated that VDOT's preliminary analysis of the load rating for only the conduits and cables was that the posting limit on the bridge (also known as weight restrictions) would need to be lowered to 21 tons for a single-axle vehicle, 25 tons for a multi-axle vehicle, and that no overload or permit vehicles would be permitted to cross. The Norris Bridge presently has a 40-ton posted weight limit. For comparison, a loaded school bus generally weighs about 15 tons, fire trucks weigh approximately 24 tons, and an 18-wheeler tractor trailer can weigh up to 40 tons.

Finally, on October 3, 2016, the Company met with VDOT representatives in Richmond to have an in-depth discussion regarding the conceptual engineering of Barnhardt Option

1, and to learn more about VDOT's requirements to approve the configuration, as well as future expectations for bridge operation, maintenance, and reconstruction. This meeting resulted in a letter sent by Dominion Virginia Power to Ms. Adams on October 14, 2016, providing more information on potential configurations and asking for further analysis and information from VDOT.

The October 14 letter is attached as my Supplemental Direct Schedule 1 and provides detailed conceptual engineering for VDOT's review and comment. The Company also requested VDOT's input, for purposes of completing the Commission's record, regarding replacement of the current bridge attachment configuration "as-is," the Company's proposed overhead construction, and VDOT's future plans for bridge maintenance, inspection and re-construction. The Company requested a response from VDOT by the end of November and will file any response received with the Commission.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

Dominion Virginia Power
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Richmond, VA 23261

dom.com

Marcie Parker
Fredericksburg District Administrator
Commonwealth of Virginia
Department of Transportation
87 Deacon Road
Fredericksburg, Virginia 22405

Dear Ms. Parker:

As you are aware, Dominion Virginia Power (Dominion) currently has a pending application before the Virginia State Corporation Commission (SCC) for approval to replace the transmission lines attached to the Robert O. Norris Bridge on Route 3 over the Rappahannock River (Case No. PUE-2015-00021). Your letters of February 19, 2016 and February 26, 2016, commenting on this project, the current condition of the Norris Bridge, and future maintenance projects were included as part of Dominion's Appendix attached to its application to the SCC, as Attachments I.C.3 and I.C.4, respectively.

Over the course of the proceedings, additional routing and technical options have been raised by the Respondents for SCC consideration, including installing a set of insulated transmission lines on the Norris Bridge (Barnhardt Option 1). Dominion has been in contact with you and your colleagues at the Virginia Department of Transportation (VDOT) and, as a result of our meeting on October 3, 2016, we are submitting this letter for your review and comment. Dominion respectfully requests your specific input on the following four areas:

Barnhardt Option 1

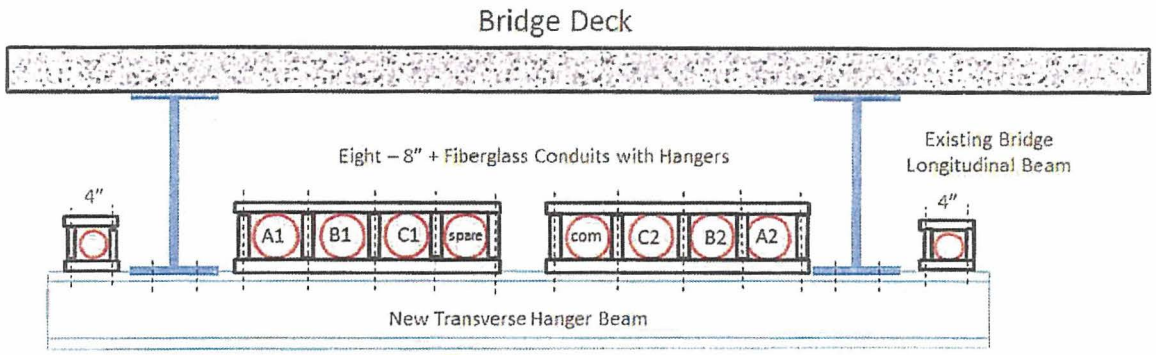
Although Dominion rejected this option, the Hearing Examiner's ruling of July 22, 2016 required the Company to "conduct further study of cost, operational impact, and environmental impacts" of Barnhardt Option 1. In order for Barnhardt Option 1 to be viable, Dominion would require VDOT permission in the form of a permit to proceed with construction.

Dominion obtained record drawings of the Norris Bridge from VDOT as a starting point to determine if there is a suitable location on the bridge structure to locate the conduit system to facilitate installation of the transmission cables and ancillary grounding and communication cables. There are three distinct sections of the bridge structure design. The first section from land is referred to as the "beam span" section. The second is known as the "girder span" section. The last design section is the "truss span" section that has several sub-types.

Dominion's initial concept for both beam span sections (totaling approximately 1,395 feet in total length) is to hang the conduits under the bridge deck. There is not enough height on these beam sections to stack conduits vertically to accommodate the eight 8-inch conduits, so the

conduits would be required to be arranged horizontally. This configuration requires a transverse hanger beam to be mounted approximately every 12 feet to adequately support the conduits and cables.

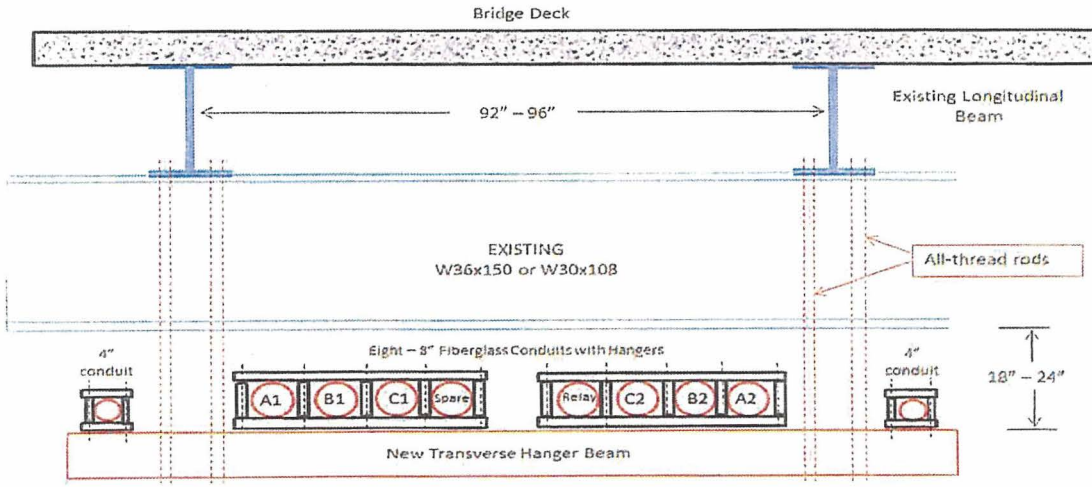
The conceptual arrangement for the conduits and cables under the bridge deck is shown below.



In this sketch, the attachment of the new transverse hanger beam is shown as being bolted to the flange of the bridge longitudinal beams. An alternate method of attachment that avoids drilling holes in the bridge beam's flange would be more appropriate; however, additional steel members would be required for such an arrangement.

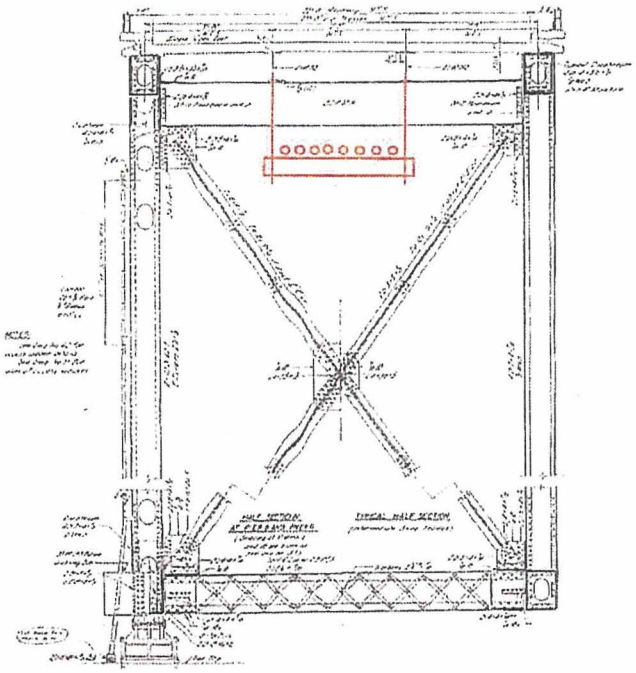
In the girder span sections of the Norris Bridge (approximately 1,500 feet in total length), the conduit system would continue to be supported from the uppermost longitudinal beams. However, the transverse hanger beams would have to be suspended further below the bridge to avoid conflicts with other structural members in the bridge.

The conceptual arrangement of the conduits in the girder sections of the bridge is shown in the following figure.



Similar to the Bridge Deck representation, this sketch shows the new transverse hanger beam as being suspended from all-thread rods bolted to the flange of the bridge longitudinal beams. Additional steel members would be required for an arrangement that avoids drilling holes in the bridge beam's flange. Additional bracing for the conduit hanging system would also be required at various points along the bridge to provide stability.

For the truss sections of the bridge, hanging the conduit system below the large transverse beams is the best way to avoid obstacles, as shown in the below figure.



Once the truss cross-section shifts the bridge deck to the bottom, the conduit system suspended from the longitudinal wide-flange beams would be hanging below the lowest parts of the existing structure. This would result in reduction of the clearance above the water approximately three to four feet.

Dominion notes, access to the conduit system from the bridge deck is required for cable installation, cable splicing, and subsequent inspections and testing over the life of the system. Currently, there are no access points on the existing bridge. An access arrangement suitable to VDOT would have to be installed by cutting the bridge deck and installing removable covers that would be bolted in place.

There is also a need to install permanent cable splicing platforms under the bridge deck at each point where the cable sections would have to be joined together. This typically takes place every approximately 2,000 feet.

Below is a summary of the various components of the conduit and cable systems and their corresponding weights that would be attached to the bridge.

Component	Quantity	Unit Weight/foot (lbs.)	Total Weight/foot (lbs.)
230 kV XLPE Cable	7	17.4	121.8
Continuity Conductors	2	1.69	3.38
8" Fiberglass Conduit	8	2.42	19.36
4" Fiberglass Conduit	2	0.92	1.84
Transverse Hangers	1 every 12 feet	384 (each hanger)	32.00
Hanger Brackets	1 every 12 feet	48.40 (each bracket set)	4.33
		TOTAL	182.71

Accordingly, with the bridge being approximately 10,000 feet long, this amounts to a total added weight of 1,827,100 pounds attached to the Norris Bridge.

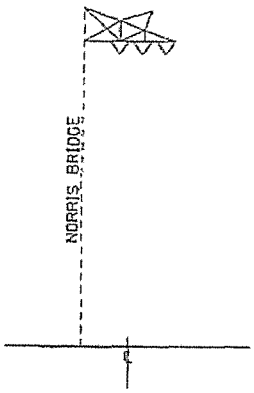
Briefly regarding construction requirements, the conceptual schedule developed to estimate the durations of major construction activities includes approximately 115 days in which a lane of traffic on the bridge would be shut down to traffic in order to install the conduits and hangers, and approximately 60 to 70 days of lane closures to install the access covers and splicing platforms. Approximately 35 days of complete closure of all bridge traffic would be required to the cable pulling setup and actual cable pull operations. Finally, an additional 48 days of lane closures would be required for splicing operations after the cables are pulled into place.

Assuming the above conceptual design parameters for Barnhardt Option 1, under what scenario(s) would VDOT approve this project? Please include as part of your response details regarding (1) any anticipated changes to the posted weight limits on the Norris Bridge; (2) operational impacts; (3) if remediation to the bridge structure would be required, please indicate the anticipated construction, costs, timelines, and lane closures required and whether Dominion would be required to compensate VDOT for any of the resulting costs; and (4) how future plans for bridge maintenance, inspection, and re-construction would be impacted.

Construction of the overhead transmission line (Line #65) in its current (or slightly modified) configuration on the Norris Bridge (115 kV Bridge Attachment Option)

Although the Company has rejected the 115 kV Bridge Attachment Option for reasons described on pages 80-81 of its Appendix to its application with the SCC, it may be important for the SCC record to obtain VDOT's review of this option because in order for it to be viable, Dominion would require VDOT permission in the form of a new or amended permit to proceed with construction.

The current (as-built) configuration of Dominion's Line #65 over the Norris Bridge consists of attachment of the transmission lines to the bridge via 14 davit arm style structures. Dominion installed these structures, shown below, by permit in 1962.



The davit arms are galvanized steel, approximately 30 feet in length, and are located on average every 450 feet.

Although rejected, to implement the 115 kV Bridge Attachment Option, Dominion would replace all on land, in-water, and bridge attachment structures due to the observed structural deficiencies, as well as all associated hardware and insulators. The existing 477 ACSR conductor would be re-used, however the 3#6 Alumoweld shield wire would be replaced. Lastly, Dominion would add conductor and static dampers to control aeolian vibration.

A high level design was completed in order to estimate cost, design characteristics, and additional steel weight. The in-water structures would be replaced structure for structure; however the alignment of those H-frame structures would be shifted easterly in order to be in the area of Baylor grounds that had been vacated. The in-water wooden H-frames would be replaced in a similar fashion as in the Company's proposed Rebuild Project: steel H-frames on concrete foundations. The existing 14 bridge attachment structures would be replaced with approximately 17 davit arm style structures. Two new "types" of on-bridge davit arm structures were conceptually developed to act as the transition structures from in-water to on-bridge. The additional structural components and hardware would add approximately 10,000 to 15,000 pounds to the bridge. The table below presents the potential maximum transverse and vertical loadings that each connection point in tension (*i.e.*, the upper two connection points) could see at each proposed structure location.

Str. No.	Tran. Force (kips)	Vert. Force (kips)
65/690	12.29	-10.72
65/691	7.9	-8.89
65/692	7.03	-5.49
65/693	7.55	-5.52
65/694	6.01	-5.06
65/695	5.6	-4.75
65/696	7.18	-4.5
65/697	7.19	-4.5
65/698	5.58	-4.76

Str. No.	Tran. Force (kips)	Vert. Force (kips)
65/699	6.08	-4.91
65/700	7.56	-5.17
65/701	7.52	-4.83
65/702	6.04	-4.68
65/703	5.57	-4.76
65/704	5.32	-4.87
65/705	5.36	-6.94
65/706	7.65	-7.9
Grand Max	12.29	-10.72

Assuming the above conceptual design parameters for 115 kV Bridge Attachment Option, under what scenario(s) would VDOT approve this project? Please include as part of your response details regarding (1) any anticipated changes to the posted weight limits on the Norris Bridge; (2) operational impacts; (3) if remediation to the bridge structure would be required, please indicate the anticipated construction, costs, timelines, and lane closures required and whether Dominion would be required to compensate VDOT for any of the resulting costs; and (4) how future plans for bridge maintenance, inspection, and re-construction would be impacted.

Construction of the Transmission Line in the Dominion's Proposed Overhead Configuration

Dominion's proposed rebuild project for Line #65 over the approximately 1.9-mile water crossing of the Rappahannock is to install 10 galvanized steel H-frame structures in the water. The centerline of the proposed H-frame structures would be located approximately 100 feet east (downstream) of the Norris Bridge. Additionally, a fender system would be installed in front of the two structures on either side of and parallel to the navigational channel for protection against boating traffic.

Dominion does not believe VDOT approval is required for its Proposed Overhead Configuration. However, assuming the above conceptual design parameters for Dominion's Proposed Overhead Configuration, does VDOT believe any future plans for bridge maintenance, inspection, and re-construction would be impacted?

Future plans for bridge maintenance, inspection and re-construction

Please describe in detail any future plans for bridge maintenance, inspection and re-construction. Please include efforts to secure funding for such plans, including expected timeframes for such plans (when expected to occur by year and duration of activities in each year).

Dominion appreciates VDOT's on-going assistance with this proposed Rebuild Project, and thanks you for your review and input regarding the above. Given the procedural schedule of the SCC case, a response to the above inquiries by no later than November 30, 2016, and sooner if possible, would be greatly appreciated.

If you have any questions or would like to discuss further, please feel free to contact Wes Keck (project manager) – 804-771-3770, Amanda Mayhew (routing and permitting) –804-771-6145, or Don Koonce (Power Delivery Consultants for Barnhardt Option 1) – 804-339-6964.

Respectfully,

Amanda Mayhew

Amanda Mayhew
Senior Siting and Permitting Specialist
Dominion Virginia Power

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Dennis D. Kaminsky

Title: Consulting Engineer – Electric Transmission Planning

Summary:

Company Witness Dennis D. Kaminsky testifies regarding Barnhardt Option 1 from a transmission planning perspective as to operational impacts. He also addresses the operational deficiencies with maintaining the current or "status quo" Line #65 bridge attachment.

Mr. Kaminsky testifies that Barnhardt Option 1 does not solve issues related to safety, operational performance and violations of mandatory North American Reliability Corporation ("NERC") Reliability Standards ("NERC Reliability Violations"). He notes that with Barnhardt Option 1, the line would need to be de-energized (as it is now) during all VDOT maintenance work such that operational performance issues and NERC Reliability Violations would continue to exist.

Specifically regarding the NERC Reliability Violations, Mr. Kaminsky explains that NERC requires all planned outages longer than six months be modeled as normal system conditions. Accordingly, the 115 kV Line #65 segment between Harmony Village and Whitestone must be modeled as out-of-service as a normal system condition for any present and future VDOT maintenances greater than six months – such as the 811-day outage currently ongoing. Under these conditions, the Company's system will have a NERC Reliability Violation starting in 2018. Barnhardt Option 1 does not prevent this violation.

Mr. Kaminsky further testifies that Barnhardt Option 1 does not solve issues related to the safety of Company personnel, who must currently maintain the Line #65 bridge attachments in a difficult and hazardous environment requiring significant traffic control.

In short, Mr. Kaminsky testifies that any transmission solution in which Line #65 is attached to the Norris Bridge – whether it be Barnhardt Option 1 or the status quo – does not solve the need for the Rebuild Project.

SUPPLEMENTAL DIRECT TESTIMONY
OF
DENNIS D. KAMINSKY
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Dennis D. Kaminsky, and I am a Consulting Engineer in the Electric Transmission Planning Department of Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company"). My office is located at One James River Plaza, 701 East Cary Street, Richmond, Virginia 23219.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted pre-filed direct testimony on behalf of Dominion Virginia Power to the State Corporation Commission of Virginia ("Commission") on February 29, 2016, in this proceeding in support of the Company's proposal to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9 mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project").

Q. What is the purpose of your supplemental testimony?

A. The purpose of my supplemental testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016, which directed the Company to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii) installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow depths

adjacent to the banks ("Barnhardt Option 2").

Specifically, I will testify regarding Barnhardt Option 1 from a transmission planning perspective as to operational impacts. I also address the operational deficiencies with maintaining the current or "status quo" Line #65 bridge attachment.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes. Company Exhibit No. __, DDK, consisting of Supplemental Direct Schedule 1, was prepared under my direction and supervision, and is accurate and complete to the best of my knowledge and belief.

Q. On pages 3-6 of your direct testimony, you discussed why the proposed Rebuild Project is needed including (i) replacement of aging infrastructure, (ii) avoiding planned outages attributable to work by the Virginia Department of Transportation ("VDOT") on the bridge, and (iii) reliability issues due to extended VDOT outages. Does Barnhardt Option 1 solve the identified need?

A. No, it does not. Barnhardt Option 1 would not solve issues related to safety, operational performance and violations of mandatory North American Reliability Corporation ("NERC") Reliability Standards ("NERC Reliability Violations" or "Reliability Violations"). As noted in my direct testimony, the close proximity of Line #65 in its current configuration to the Norris Bridge deck requires that this section of the line be de-energized when any maintenance work is performed by VDOT. Even if the davit style arms on the side of the bridge supporting Line #65 were replaced with insulated cables in conduits on the underside of the bridge, this segment of Line #65 would still need to be de-energized during VDOT maintenance work as discussed in the supplemental direct

testimony of Company Witness Donald E. Koonce. In other words, there is no improvement to the current situation – a situation, which has caused this segment of Line #65 to be out-of-service approximately 50% of the time since 2010 and presently, as of September 20, 2016, be out-of-service for an 811-day period while the center span of the bridge is painted.

Because this segment of Line #65 would still need to be out-of-service for present and future VDOT maintenance, the safety and operational performance issues along with the NERC Reliability Violations would still exist with Barnhardt Option 1.

Q. Please elaborate on the NERC Reliability Violations that would not be solved by Barnhardt Option 1.

A. Both PJM and Dominion Virginia Power have criteria prohibiting the loss of 300 MW on the system. This 300 MW threshold is based, in part, on the Department of Energy's ("DOE") reporting guidelines, which require any actual event resulting in the loss of 300 MW of load or 50,000 customers be reported to DOE.

On January 1, 2015, the new NERC Reliability Standard TPL-001-4 became effective. This standard now requires that planned outages longer than six months be modeled as normal system conditions. Accordingly, the 115 kV Line #65 segment between Harmony Village and Whitestone must be modeled as out-of-service as a normal system condition for any present or future VDOT maintenance outages greater than six months. Indeed, the present 811 day outage of this segment of Line #65 due to VDOT maintenance is being modeled as a normal system condition in the PJM and Dominion Virginia Power planning analyses.

Under these conditions, the N-1-1 Contingency for loss of the 230 kV Line #2083 (Fredericksburg – Birchwood) and subsequent loss of 230 kV Line #224 (Lanexa – Northern Neck) results in projected load loss greater than 300 MW starting in 2018. This NERC Reliability Violation is shown in my Supplemental Direct Schedule 1.

Q. Are there any other operational issues you have identified with Barnhardt Option 1?

A. Yes. Barnhardt Option 1 would also not solve issues related to the safety of Company personnel. As detailed in the Power Deliver Consultants Report sponsored in the supplemental direct testimony of Company Witness Koonce ("PDC Report"), installation of insulated transmission cables on the bridge would not be maintenance free going-forward. Various components of the cable system require routine maintenance, ranging from visual inspections to in-depth electrical tests.

Currently, Dominion Virginia Power maintenance of the Line #65 bridge attachments requires significant traffic control due to the narrow width of bridge. This puts Company personnel at risk while performing work in an already difficult environment, and vibration from bridge traffic exacerbates the hazardous conditions. Additionally, the Company must rely on VDOT to supply a safe and secure foundation for the Company personnel during these inspections. The Supplemental Direct Schedule 1 of Company Witness Jacob G. Heisey provides photographs from a recent inspection showing the hazards of such maintenance work.

Q. Would these safety conditions improve with the construction of Barnhardt Option 1?

A. No, they would not. The PDC Report details the inspections that would be required for Barnhardt Option 1 and notes all inspections would likely require a lane closure on the bridge to facilitate access to the cable system. This means Dominion Virginia Power personnel will still be required to work in hazardous traffic conditions on the narrow bridge and on infrastructure that is under VDOT control.

Q. Have you identified any operational impacts associated with Barnhardt Option 2?

A. The type of operational impacts that I am addressing relating to the existing Line #65 arrangement and Barnhardt Option 1 do not exist with Barnhardt Option 2 because it is not attached to the Norris Bridge. Company Witness Koonce and the PDC Report address the analysis related to Barnhardt Option 2.

Q. Mr. Kaminsky, please summarize the operational issues associated with Barnhardt Option 1, or any transmission alternative in which Line #65 is attached to the Norris Bridge.

A. Any transmission solution in which Line #65 is attached to the Norris Bridge – whether it be Barnhardt Option 1 or the status quo – does not solve the need for the Rebuild Project. VDOT bridge maintenance projects often require this segment of the line to be out-of-service, as has been the case over 50% of the time over the last seven years. When this happens, this section of Dominion Virginia Power's transmission system must operate in a radial (rather than networked) configuration. This configuration degrades the integrity and availability of the transmission system as a whole, and negatively impacts the reliability of electric power specifically to almost 19,000 customers in the Northern Neck

area. Any event that causes a sustained outage to the 29.4 miles of Line #65 between Northern Neck and White Stone Substations while in this configuration will result in extended outages to these customers as there is no backup and the problem must be found and fixed prior to restoration of electric power.

Additionally, with NERC Reliability Violations looming in 2018 and beyond that would not be solved by Barnhardt Option 1 or the status quo, along with the safety issues that would still persist, I do not believe these options should be considered further by the Commission because they do not resolve the identified need for the Rebuild Project.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

N-1-1 Load loss for 224 Line and 2083 Line without Norris Bridge Crossing on 65 Line

2021 RTEP Case using 2016 Load Forecast

Bus	Station Name/kV	DP #	Zone	MW	MVAR	65 Line MW
314172	6DUNNSVL 230.00	1	345 DVP	17.46	0.708	
314172	6DUNNSVL 230.00	2	345 DVP	15.54	-0.257	
314183	6SANDERS 230.00	D1	345 DVP	17.145	5.563	
314190	6WESTMOR 230.00	1	345 DVP	14.842	-0.132	
314139	6OAKGROV 230.00	1	345 DVP	19.71	-1.572	
314139	6OAKGROV 230.00	2	345 DVP	15.277	-5.197	
313810	6DAHLGREN 230.00	1	345 DVP	18.548	5.016	
313810	6DAHLGREN 230.00	2	345 DVP	19.797	-0.053	
314131	6ARNOLDS 230.00	1	345 DVP	26.528	0.114	
314131	6ARNOLDS 230.00	2	345 DVP	6.015	-6.478	
314175	6COMORN 230.00	D1	345 DVP	5.203	1.707	
314163	6FINES 230.00	1	345 DVP	22.747	6.057	
314181	3NORNECK 115.00	1	345 DVP	13.534	2.647	
314181	3NORNECK 115.00	5	345 DVP	24.449	8.036	
314173	3GARNER 115.00	D2	345 DVP	19.91	5.735	19.91
314178	3LANCAST 115.00	1	345 DVP	6.907	2.584	6.907
314178	3LANCAST 115.00	2	345 DVP	14.727	2.844	14.727
314178	3LANCAST 115.00	3	345 DVP	13.169	0.682	13.169
313813	3OCRAN 115.00	1	345 DVP	11.476	0.538	11.476
314191	3WHIT STONE 115.00	1	345 DVP	7.832	2.166	7.832
Total			2021 Projection	310.816	30.708	74.021
Scaling PJM forecast back to 2018			2018 Projection	302.623		72.070

N-1-1 Load loss for 224 Line and 2083 Line without Norris Bridge Crossing on 65 Line

Future Years	DOM Load Forecast	% of 2021	Total Load Loss	65 Line Loss	Difference
2018	20,499	0.973639	302.62	72.07	230.55
2019	20,813	0.988553	307.26	73.17	234.08
2020	20,882	0.991831	308.28	73.42	234.86
2021	21,054	1	310.82	74.02	236.80
2022	21,244	1.009024	313.62	74.69	238.93
2023	21,421	1.017431	316.23	75.31	240.92
2024	21,640	1.027833	319.47	76.08	243.39
2025	21,854	1.037998	322.63	76.83	245.79

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Jacob G. Heisey

Title: Transmission Line Engineer II

Summary:

Company Witness Jacob G. Heisey updates the Commission regarding the structural integrity of the current Line #65 transmission facilities at the Rappahannock River crossing. He presents and supports the findings from the Company's August 30, 2016 inspection of the current facilities.

Mr. Heisey testifies that, setting aside the issue that maintaining the "status quo" of the current facilities does not resolve the need for the Rebuild Project, the Company conducted the recent inspection as a result of inquiries from the Commission Staff. He notes that the seven wooden structures in the water were inspected prior to the application, so the August 30th inspection focused on the 14 bridge attachments.

Mr. Heisey explains that the inspection revealed that several of the davit arm structures have holes from corrosion, there is rust on the inside of members, and the arms and hardware are cracking and corroding. The insulators are in poor condition. And the existing shield wire appears to also be in poor condition.

Mr. Heisey testifies that the findings of the inspection were consistent with engineering expectations for the end of the useful life for a transmission line built in 1962, in a salt water environment. All on land, in-water, and bridge attachment structures supporting Line #65 as it crosses the Rappahannock River would be in need of replacement if an "as is" option were pursued. He notes, Company Witness Kaminsky explains why replacement of the structures "as is", would not meet the need for the Rebuild Project identified by the Company.

SUPPLEMENTAL DIRECT TESTIMONY
OF
JACOB G. HEISEY
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Jacob G. Heisey, and I am a Transmission Line Engineer II for Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company"). My office is located at One James River Plaza, 701 East Cary Street, Richmond, Virginia 23219.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted pre-filed direct testimony on behalf of Dominion Virginia Power to the State Corporation Commission of Virginia (the "Commission") on February 29, 2016 in this proceeding in support of the Company's proposal to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9 mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project").

Q. What is the purpose of your supplemental testimony?

A. The purpose of my supplemental testimony is to update the Commission regarding the structural integrity of the current Line #65 transmission facilities at the Rappahannock River crossing. Specifically, I will present and support the findings from the Company's August 30, 2016 inspection of the current facilities.

Q. Are you sponsoring any exhibits in this proceeding?

A. Yes. Company Exhibit No. __, JGH, consisting of Supplemental Direct Schedule 1, was

prepared under my direction and supervision, and is accurate and complete to the best of my knowledge and belief.

Q. Why did the Company inspect the current facilities on August 30, 2016?

A. The inspection was scheduled as a result of certain inquiries made to the Company during the course of discovery in this proceeding. Commission Staff's ("Staff") Question No. 40 of their Fourth Set asked, "If the Company were directed or authorized only to maintain the status quo of the existing segment of Line #65: (a) Describe what work would be required to replace the aging infrastructure (*i.e.*, wooden poles, bridge attachments, insulators, etc.) with newer facilities and provide a cost estimate for the work that would be required. . ." Setting aside the issue that maintaining the "status quo" does not resolve the need for the Rebuild Project as set forth in the direct testimony and supplemental direct testimony of Company Witness Dennis D. Kaminsky, the Company conducted additional review of the bridge in order to answer the Staff's question.

The water crossing facilities were installed in 1962. Prior to filing the application for the Project, the Company had inspected the seven wooden structures in the water. As seen in Attachment I.A.3 of the Appendix to the application (pp. 10-33), the poles were splitting/checking, copper sheathing was missing, ground wires were broken, and there was extensive corrosion on the hardware and cross-arms.

I, along with other members of the Dominion Virginia Power electric transmission team, visited the Norris Bridge on August 30, 2016 to specifically inspect the 14 bridge attachments and evaluate those facilities for integrity and corrosion to respond to Staff's inquiry.

Q. What did the inspection entail?

A. Prior to the inspection, the Company arranged a one-day outage of Line #65. Additionally, the Company arranged with the Virginia Department of Transportation ("VDOT") for the northbound lane of traffic across the bridge to be closed while Company personnel were on-site. The lane was closed to traffic for approximately 5 hours, costing the Company approximately $2,600 for a contractor to control traffic.

Once on-site, the group was briefed as to safety precautions in the bridge environment and divided into two teams: one team to focus on the structures on the northern end of the bridge, and one for the southern end. Company personnel were also patrolling the water below as an additional safety measure.

The structures were first inspected visually from the bridge. Next, Dominion Virginia Power linemen physically climbed onto the structures from the bridge. Pictures were taken using digital cameras and bore scopes, and notes were taken on the condition of the structures and hardware. Structure member thicknesses were also measured using a digital micrometer.

The photographs from this inspection are attached as my Supplemental Direct Schedule 1.

Q. What were the results of your inspection?

A. Several of the bridge davit arm structures have holes from corrosion. The bore scope allowed us to see rust on the inside of members that otherwise would have gone unnoticed. The davit arms and hardware are cracking and corroding. The insulators appear to be in poor condition and there is obvious bird dropping contamination.

Although time did not permit inspecting the existing shield wire for broken strands or cracking, it visually appeared to also be in poor condition. Indeed, in some instances, the observed cracking measured almost a foot in length. The photographs contained in my Supplemental Direct Schedule 1 demonstrate the extent of the damage. No visible broken strands of phase conductor were found, however, significant Aeolian vibration was observed as well, which is known to cause additional stress on hardware.

Q. What is the significance of these findings?

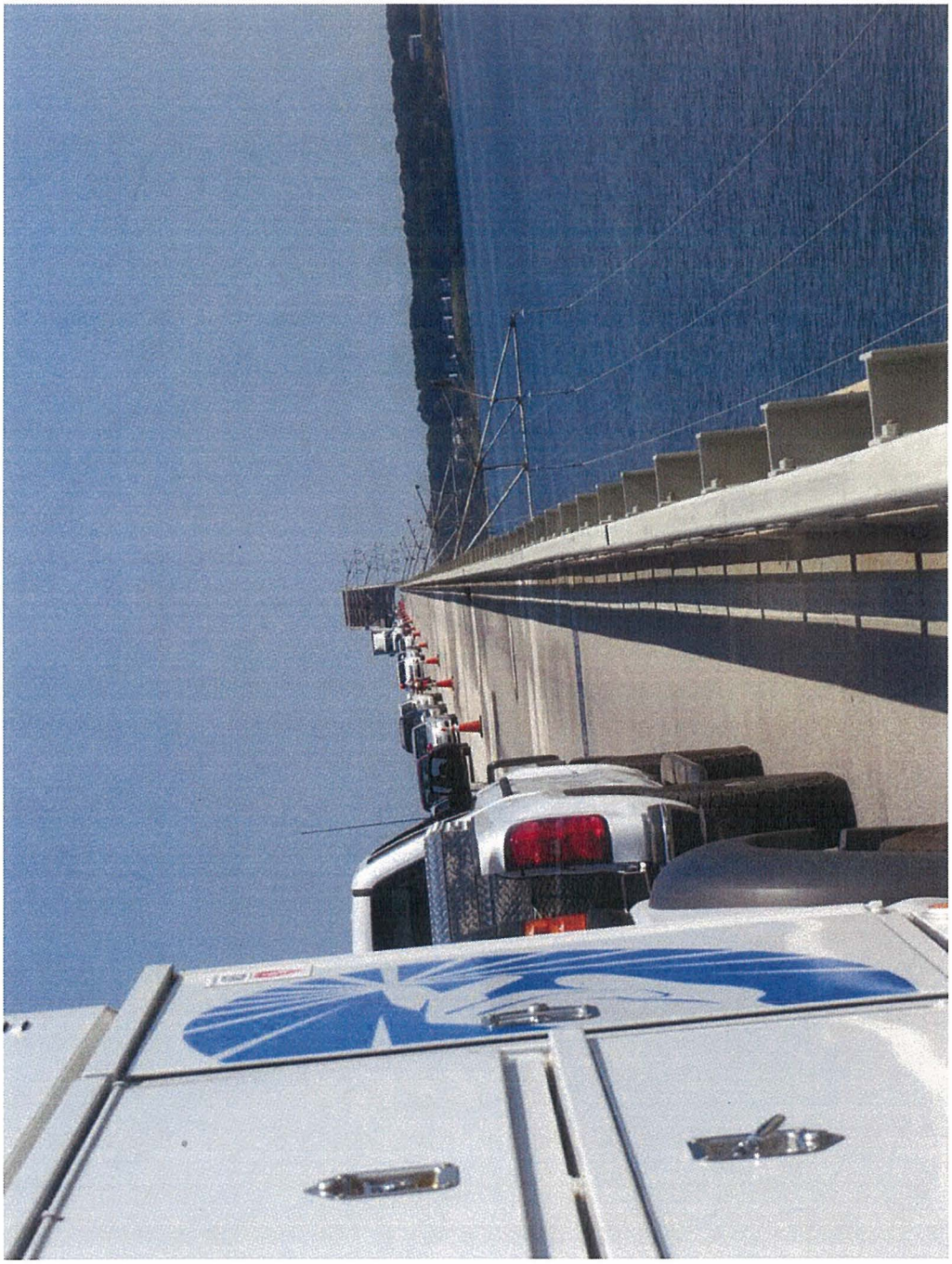
A. Our findings were consistent with engineering expectations for the end of useful life for a transmission line built in 1962, in a salt water environment. All on land, in-water, and bridge attachment structures supporting Line #65 as it crosses the Rappahannock River (wooden poles, davit arms, hardware, insulators, and shield wire) would be in need of replacement if an "as is" option were pursued. As mentioned above, however, Company Witness Kaminsky explains why replacement of the structures "as is" would not meet the need for the Rebuild Project identified by the Company.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

Norris Bridge Inspection Photos

August 30, 2016

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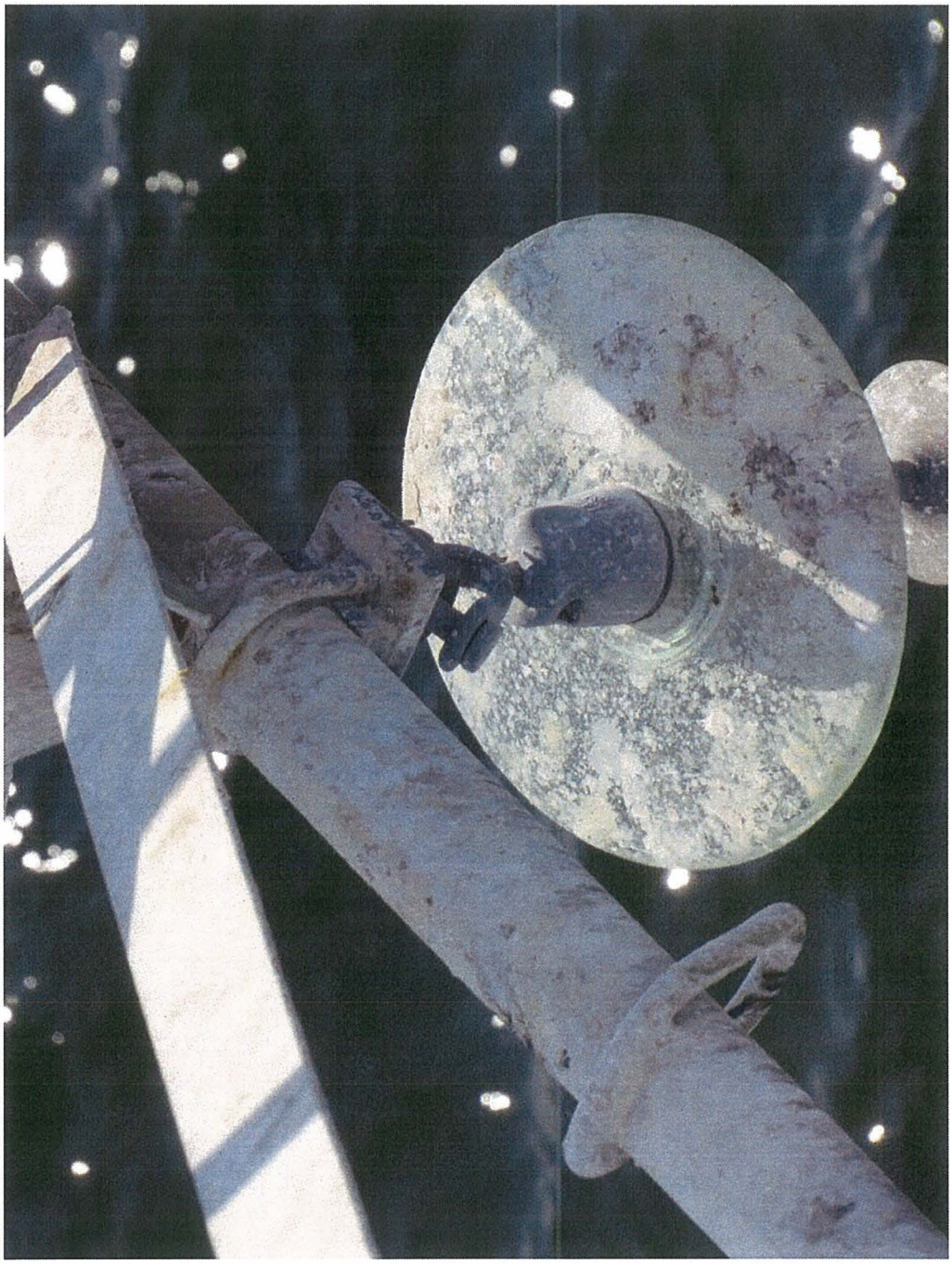

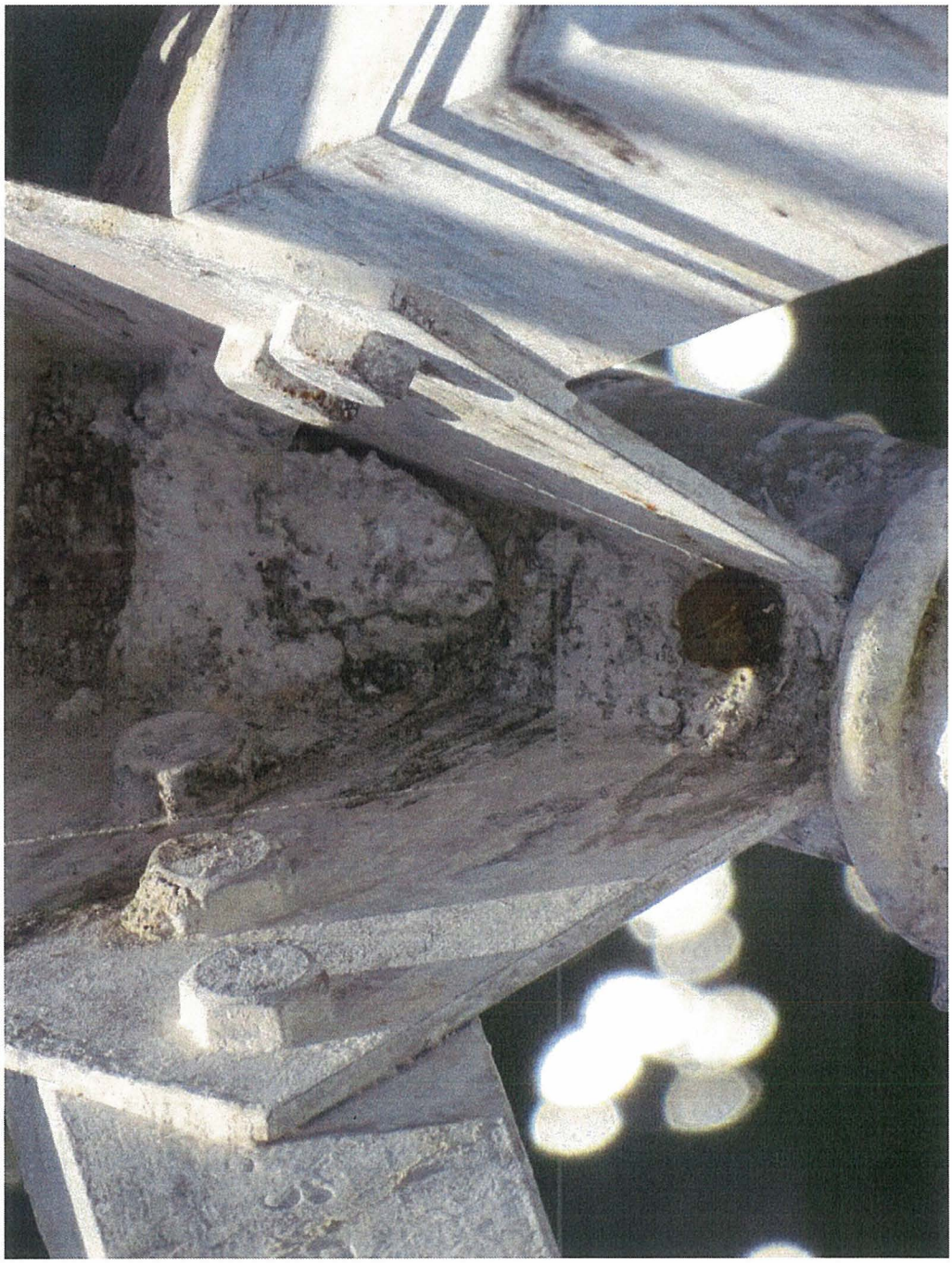

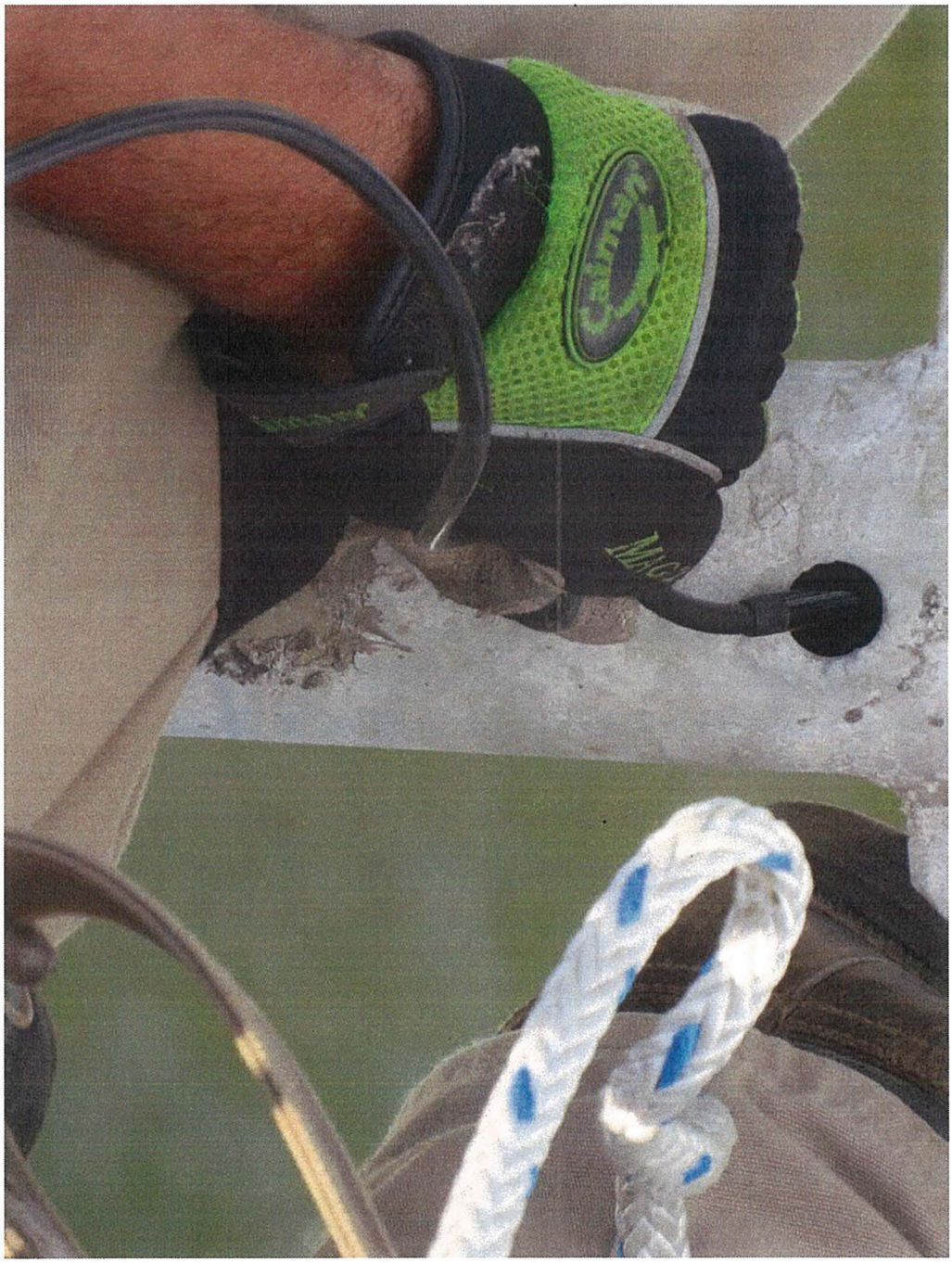

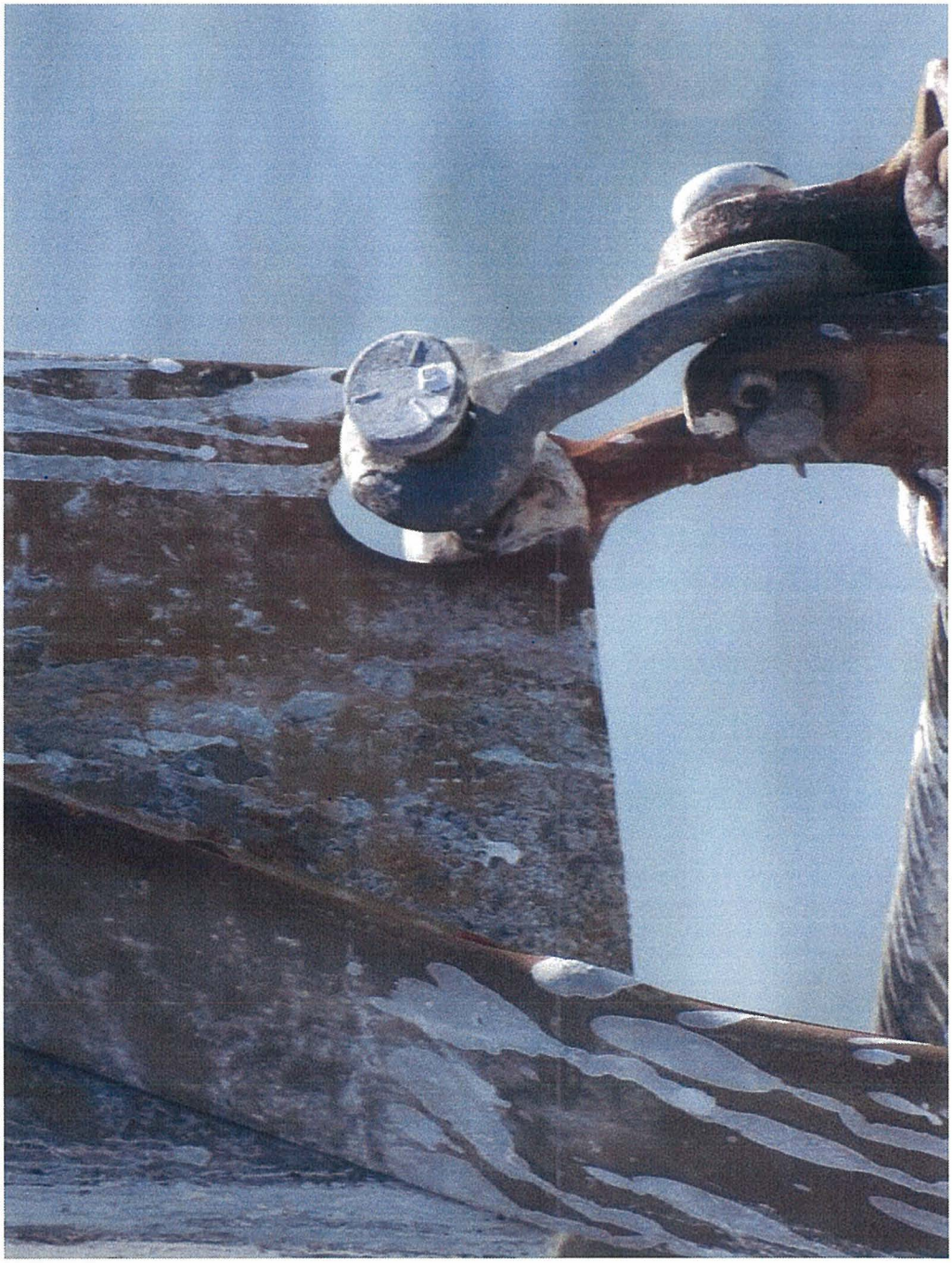

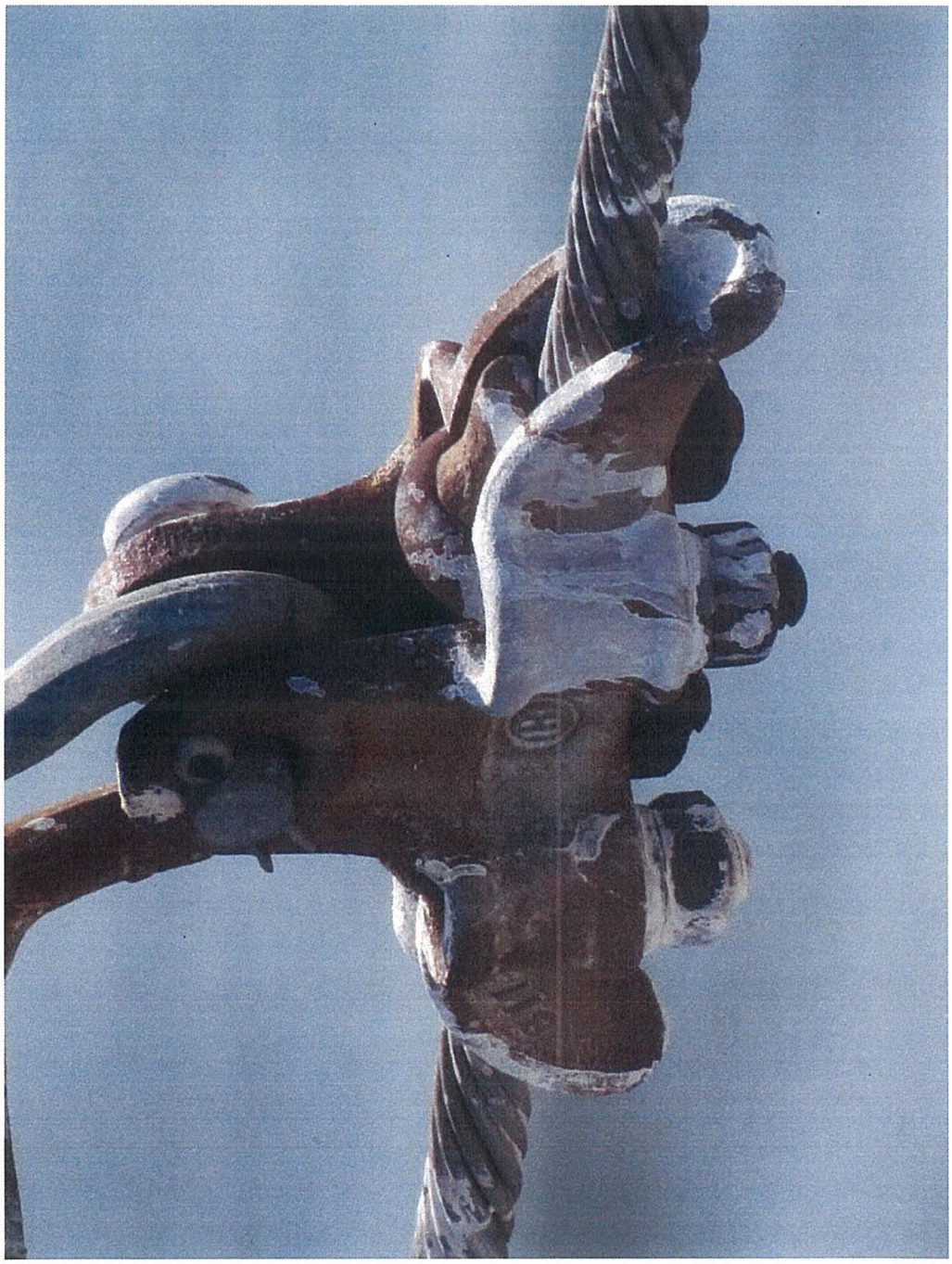

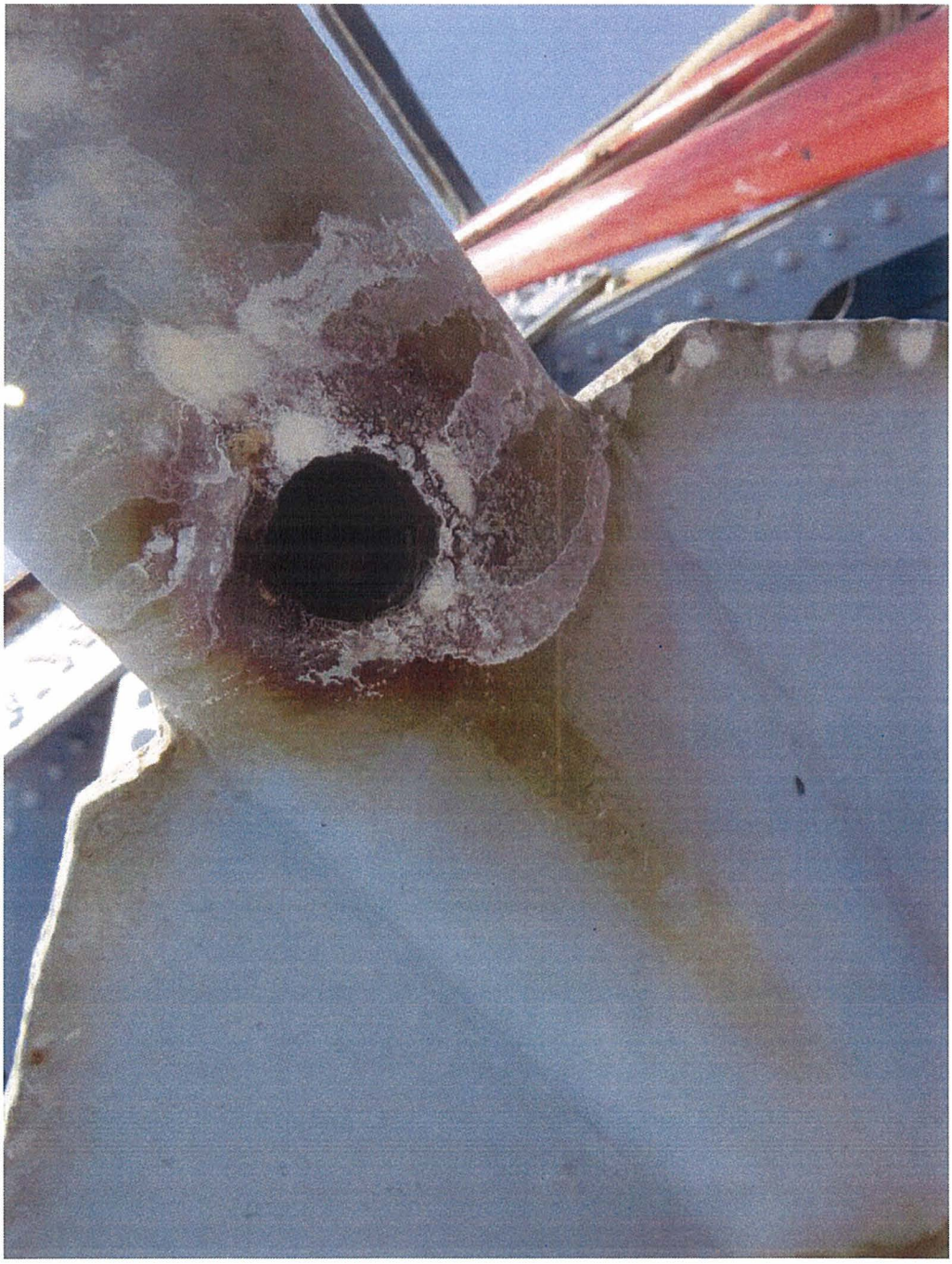

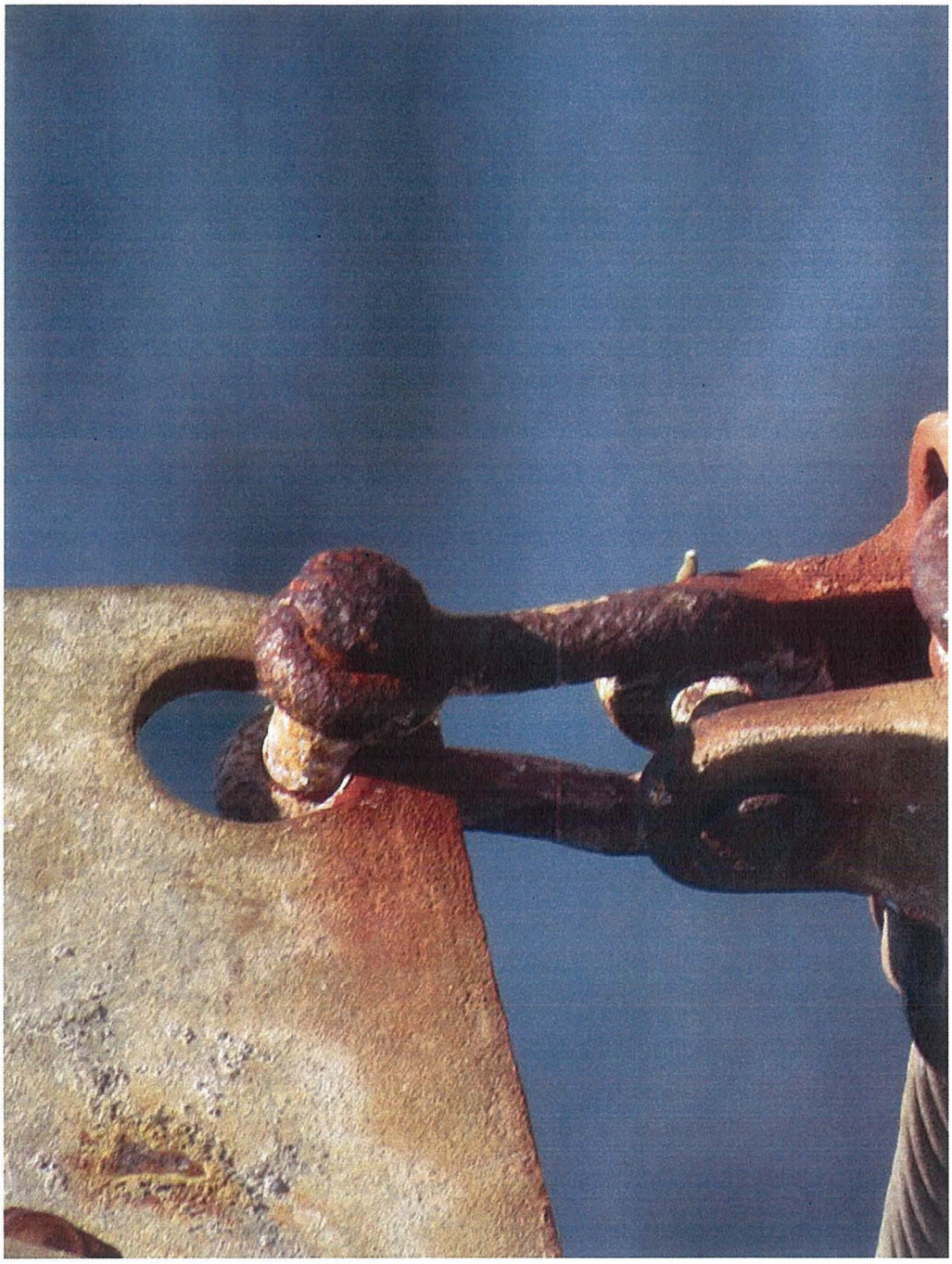

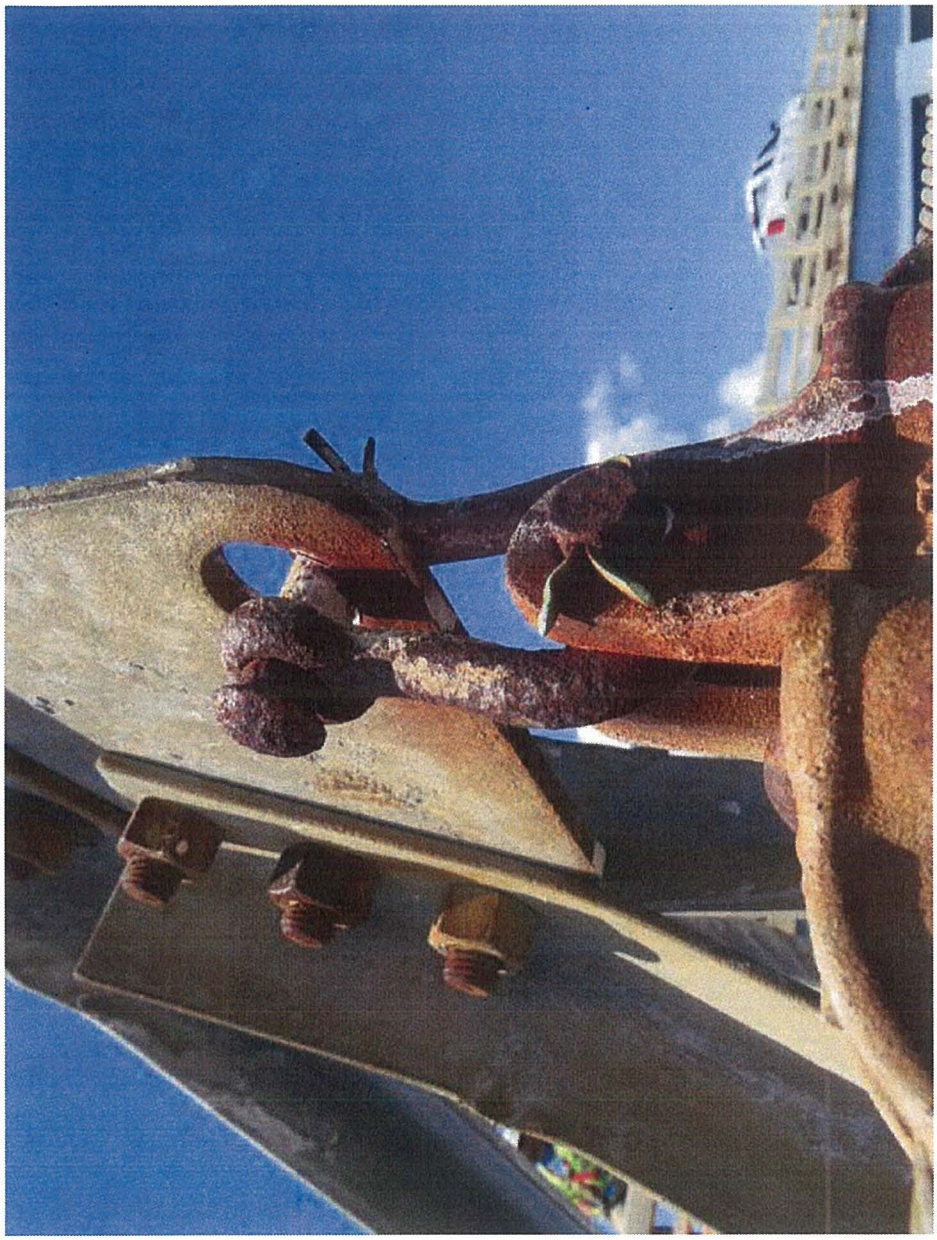

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Donald E. Koonce

Title: Principal Consultant – Power Delivery Consultants, Inc.

Summary:

Company Witness Donald E. Koonce sponsors the evaluation conducted by Power Delivery Consultants, Inc. ("PDC") of the feasibility of Barnhardt Options 1 and 2, which includes the conceptual engineering for these options. PDC's analysis and evaluation are attached as Supplemental Direct Schedule 1 to Mr. Koonce's testimony.

In addition, Mr. Koonce provides a comparison of the Company's Underground Option to Barnhardt Option 2, including costs associated with those options. He concludes that the Company's Underground Option is preferable to Barnhardt Option 2 in terms of cost as well as operational considerations.

SUPPLEMENTAL DIRECT TESTIMONY
OF
DONALD E. KOONCE
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Donald E. Koonce, and I am a Principal Consultant with Power Delivery Consultants, Inc. ("PDC"). My business address is 2241 Parkers Hill Drive, Maidens, Virginia 23102. A statement of my background and qualifications is attached as Appendix A.

Q. Have you previously submitted testimony in this proceeding?

A. No, I have not.

Q. What is the purpose of your supplemental testimony?

A. The purpose of my supplemental testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016, which directed Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company") to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii) installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow depths adjacent to the banks ("Barnhardt Option 2").

Specifically, Dominion Virginia Power hired PDC to evaluate the feasibility of Barnhardt Options 1 and 2 and to do the conceptual engineering for these options. PDC's analysis

and evaluation is attached as my Supplemental Direct Schedule 1.

Q. Have you also compared the Company's underground option as presented in the Application and Appendix ("Underground Option") to Barnhardt Option 2?

A. Yes. The Company's Underground Option sets forth a High-Pressure Fluid-Filled ("HPFF") cable system for the river crossing. Although underground lines in general are not as reliable as overhead lines in Dominion Virginia Power's transmission system, HPFF cable circuits have a long history of proven service. The Company's first underground circuit was installed in 1970 and employed HPFF technology in a similar submarine application in Hampton Roads. The circuit can be expected to last many more years provided proper maintenance is done as required. Indeed, some HPFF systems around the country have been in service for over 80 years, demonstrating their longevity.

In contrast, cross-linked polyethylene ("XLPE") insulated cables operating at 230 kV have a very short operating history in the Company's transmission system. Dominion Virginia Power installed its first 230 kV XLPE cable circuit, approximately 1,500 feet in length, in Arlington, Virginia, in 2009. This is only seven years of service history as compared to the 46 years of service history of the first HPFF circuit. This circumstance is generally the same for electric utilities across the country. It is also important to note that XLPE cables utilized in armored submarine cables operating at 230 kV are very rare in both the United States and around the world; only a few have been installed in recent years. Instead, most 230 kV submarine installations have historically utilized "conventional" self-contained fluid-filled cables.

With the large capital investment required for installing any type of submarine cable

system, it is prudent to place a strong emphasis on choosing a system with a proven operating history. HPFF cable systems have clearly demonstrated their longevity both in the Company's system and around the United States.

Q. How does the cost of the Company's Underground Option compare to Barnhardt Option 2?

A. The total cost of Barnhardt Option 2, estimated to be $92.3 million, is $8.7 million more expensive than the Company's Underground Option, which was estimated to cost $83.6 million.

Q. Mr. Koonce, although not preferred by the Company for the Project, if the Commission were to determine that underground construction was appropriate in the present proceeding, do you have an opinion whether the Company's Underground Option or Barnhardt Option 2 should be selected?

A. Yes, I do. Based on factors such as the lack of operating history for XLPE submarine cables in the utility industry, the $ 8.7 million lower cost for the HPFF cables, the robustness of the HPFF cables along with Dominion Virginia Power's operating experience and familiarity with this technology, I recommend the Company's Underground Option be selected if the Commission were to determine underground construction is appropriate for this river crossing.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

APPENDIX A

Donald E. Koonce — Transmission Cable Specialist

Don Koonce has 33 years' experience in designing, installing, maintaining, and repairing underground transmission systems, for both pipe-type and extruded-dielectric cable systems. He is currently Principal Consultant at Power Delivery Consultants (PDC). PDC's primary business is providing utilities with expert assistance on all aspect of high-voltage underground transmission lines. Prior to joining PDC, he was Principal Engineer, Electric Transmission Reliability at Dominion Virginia Power where he has been employed since 1981. He also provides specialized consulting services in underground transmission systems to other organizations. Mr. Koonce retired from Dominion Virginia Power in 2015 and became more engaged in consulting services.

He has held various supervisory and engineering positions in transmission line design, standards and has a current position in transmission system operations and maintenance engineering support. All work has been associated with both overhead and underground transmission lines. Past responsibilities include managing operations and maintenance activities for 6,000 miles of transmission lines. He is currently responsible for reliability analysis of present transmission system and making recommendations for reliability enhancements. In the late 1970's and early 1980's he was an engineer for the Rural Electrification Administration (REA) involved in both transmission and distribution line specification review/approval for compliance with REA design and material requirements.

Mr. Koonce was Project Engineer for a major pipe-type cable installation in the early 1990's and prepared the publication *Glebe – Pentagon 230-kV underground cables, the Pentagon Project.* This project received the Southeastern Electric Exchange's Excellence in Engineering Award in 1993.

He has been a major technical contributor for several other cable projects, for voltages from 69 kV to 230 kV, as summarized on the following pages.

Mr. Koonce received a Bachelor of Electrical Engineering from the University of Delaware, and he has taken additional courses in underground cable system planning, design, installation, operation, and failure analysis. He is a member of the IEEE Power Engineering Society, the IEEE Standards Association, and the IEEE Insulated Conductors Committee. He is also a Voting Member of the Engineering Safety, Maintenance and Operation of Lines (ESMOL) Subcommittee of the IEEE Transmission and Distribution Committee. He was the chairman and original convener of the IEEE, Insulated Conductors Committee (ICC) Working Group on

Electric and Magnetic Fields of Underground Cables. He is currently the Vice-Chairman of the ICC Discussion Group on Pipe-Type Cables. Mr. Koonce has a North Carolina General Contractor's License and is a Certified Engineer-in-Training.

Donald E. Koonce – Representative Projects

Haymarket 230kV Transmission Lines (2016)

Provided expert testimony in the proceedings before the Virginia State Corporation Commission (SCC) regarding the feasibility, routing, construction impediments and costs associated with a 230kV XLPE underground option for a double-circuit overhead line near Haymarket, Virginia.

HPFF Cable System Riser Pipe Repair Procedure (2016)

Designed and developed a full scale test procedure to evaluate a potential repair procedure for an operational 230kV HPFF circuit that experienced some damage to a stainless steel riser pipe. Worked hand-in-hand with a welding contractor to simulate actual field conditions and then monitored cable surface temperatures while a stainless steel patch was welded on the simulated riser pipe. Based on the data obtained in the test, a repair procedure was developed for the utility client.

Warrenton 230kV Transmission Lines (2015)

Provided expert testimony in the proceedings before the Virginia State Corporation Commission (SCC) comparing the reliability of several overheard transmission line options near Warrenton, Virginia. The analysis involved comparing the reliability of double circuit verses single circuit line designs.

Aquia Harbor – Garrisonville 230kV Underground Lines (2010)

Provided expert testimony in the proceedings before the Virginia State Corporation Commission (SCC) on an underground alternative for a 5.5 mile double-circuit, 230kV transmission line in Stafford County, Virginia. This project was ordered by the SCC to be constructed underground. Phase I of this project (29,000 feet of cross-linked polyethylene (XLPE) insulated cable) was placed in service in June of 2010. The remaining 87,000 feet of cable will be installed the following year. Provided technical consulting services to Dominion's transmission engineering department to develop engineering design and reviewed construction specifications. Performed final inspections of cable installation, splice supports in manholes and sheath bonding components.

Pleasant View – Hamilton 230kV Underground Lines (2010)

Provided expert testimony in the proceedings before the Virginia SCC on an underground alternative for a 2.1 mile double-circuit, 230kV transmission line in Loudoun County, Virginia. This project was ultimately constructed underground and utilized XLPE cable. Provided technical consulting services to Dominion's transmission engineering department to develop engineering design and reviewed construction specifications.

Kewaunee Nuclear Power Station 138kV RSST Project (2009)

Provided on-site construction monitoring for installation of a 138kV XLPE cable system with two cables per phase. Southwire provided the cable and accessories and also performed the installation.

Craney Island – Tanners Point 230kV HPFF Submarine Cables (2007)

Provided technical consulting services to Dominion's transmission engineering department to develop engineering design and reviewed construction specifications. Performed on-site monitoring of two 7,500-foot long cable pulls.

115kV Temporary Construction Cables (2005)

Developed a novel approach to utilize off-the-shelf 69kV cables (energizing them at 115kV) and accessories to provide temporary bypass lines for construction of both overhead lines and substation facilities. Developed construction sequences and switching procedures for deploying these cables on over 100 projects. These cables enable work to be done without interruption of service to customers. They have also resulted in significant savings on many projects.

Norfolk Naval Base 230kV HPFF Cables (2003 and 2005)

Provided training for Dominion's in-house engineering staff in support of the design of these underground lines. Reviewed construction specifications prior to issuing Request for Quotations from contractors. Performed on-site monitoring of cable pulling, splicing and terminating. Worked with vendor on pressurization plant commissioning.

"Davis" Substation – 69kV Cable Termination Replacements (2004)

Provided technical consulting services to Dominion's operations department on an in-service failure of a 69kV cable termination on an EPR-insulated cable. Developed a retro-fit plan to remove all the original terminations and re-terminate the cables with heat-shrink polymeric terminations.

230kV HPFF "Dig-In" Damage Repair (2004)

Provided technical consulting services to Dominion's operations department on third-party dig-in damage incident involving a 230kV HPFF cable system. Worked with cable company engineers and contractor to develop repair techniques. Performed work on pressurization plant to accommodate re-pressurization of the cables.

"Davis" Substation and Cable Project (1991)

Provided training for Dominion's in-house engineering staff in support of the design of these underground lines. Supervised the engineering group involved in designing the interface of new facilities with existing lines acquired from another utility. This project involved diverting existing cable systems (69kV MPFF, 69kV HPFF and 230kV HPFF cables) into a new substation. An additional 2.4 miles of new 230kV HPFF double-circuit cable was also installed. Performed on-site monitoring of cable pulling, splicing and terminating. Worked with multiple vendors commissioning pressurization plants.

Burke – Sideburn 230kV HPFF Cable Project (1986)

Performed the engineering and design work for 2.2 miles of 230kV HPFF cable. Perform in-situ soil thermal analysis for the cable route. Performed on-site monitoring of cable pulling, splicing and terminating. Commissioned pressurization plant.

DOMINION VIRGINIA POWER
EVALUATION OF CABLE OPTIONS FOR
RAPPAHANNOCK RIVER CROSSING

XLPE CABLES ATTACHED TO THE NORRIS BRIDGE
XLPE SUBMARINE CABLES BURIED IN THE RIVER BOTTOM

1.0 INTRODUCTION

Dominion Virginia Power (Dominion) requested Power Delivery Consultants, Inc., (PDC) to evaluate the feasibility of two alternatives to install underground transmission cable circuits across the Rappahannock River near Whitestone, Virginia. The cables would be insulated with what is known in the utility industry as "cross-linked polyethylene" (XLPE) insulation. The cables would be designed and manufactured for potential 230kV operation; however, they would initially be operated at 115kV as is the existing overhead transmission line currently attached to the Norris Bridge crossing the river.

The two cable alternatives evaluated were specifically defined by the Virginia State Corporation Commission's (SCC) Hearing Examiner. The first alternative is for "installing a set of insulated transmission lines on the Norris Bridge" and is referred to as "Barnhardt Option 1." The second alternative studied is for "installing insulated transmission lines in shallow trenches across the river in conjunction with horizontal directional drilling (HDD) pathways from the north and south banks traversing the shallow depths adjacent to the banks" and is referred to as "Barnhardt Option 2."

PDC is a consulting engineering firm specializing in the design of underground transmission facilities. PDC has performed similar evaluations for a variety of utility clients throughout the USA.

2.0 OVERVIEW OF BARNHARDT OPTION 1

In this alternative, insulated cables are to be attached to the Norris Bridge to facilitate the crossing of the Rappahannock River. The approximately 60-year old bridge is approximately 10,000 feet long and there are three distinctly different designs for the supporting structure for the bridge deck. This will be discussed in more detail later in this report. Within this alternative, there are also land sections on each side of the river from the shoreline back to the overhead-to-underground transition stations. A conventional concrete-encased duct bank would be installed

for each of these sections. For this conceptual study, it was anticipated these sections would be installed with open trenching methods.

Dominion has requested there be a total of seven cables for this underground cable crossing for reliability reasons. The cables would be configured to operate with two cables for each of the three alternating current phases and there would be one spare cable. The spare cable would be energized from one end, but not connected to the circuit on the other end. This arrangement would keep the cable energized but it would not carry any load current. This is a common utility practice on underground XLPE cable circuits to expedite restoration in the event of a cable failure.

2.1 ATTACHING CABLES TO THE NORRIS BRIDGE (Barnhardt Option 1)

2.1.1 CONDUIT SYSTEM

Dominion obtained record drawings of the Norris Bridge from the Virginia Department of Transportation (VDOT). These drawings provided a starting point for determining if there is a suitable location on the bridge structure to locate the conduit system to facilitate the installation of the underground transmission cables and ancillary grounding and communications cables. There are three distinct sections of the bridge structure design. The first section from land is referred to as the "beam span" section. The second is known as the "girder span" section. The last design section is the "truss span" section that has several sub-types.

Both beam span sections total approximately 1,395 feet and the bridge deck is supported by longitudinal wide-flange steel beams supported on concrete foundations. After a thorough review of the drawings, PDC developed an initial concept to hang the conduits under the bridge deck. There is not enough height on these beams to stack conduits vertically to accommodate the eight 8-inch conduits in this section so the conduits were arranged horizontally. This configuration requires a transverse hanger beam to be mounted approximately every 12 feet to adequately support the conduits and very heavy cables. Upon further review, this initial concept was found to be unacceptable due to the large number of obstacles located along the underside of the bridge deck. Examples of these obstacles included large pieces of steel channel referred to as "diaphragms" and other pieces of steel that make up the numerous expansion joints along the bridge.

The Dominion project team conducted a field inspection of the bridge structure from a boat to further investigate a suitable location for the conduits to be attached to the bridge structure. Details of the bridge structure were examined closely to assess ways to avoid conflicts with components of the bridge. There are some conflicts with steel bridge members at a number of locations in the beam span section that probably cannot be avoided. There will likely be modifications to the bridge required in order to get the conduits through these areas. The cost estimate for this option (presented later in this report) does not include any costs for making modifications to the bridge to accommodate the conduits since the extent of the modifications is not known at this time.

The following photograph (Figure 1) shows the types of obstacles mentioned above:

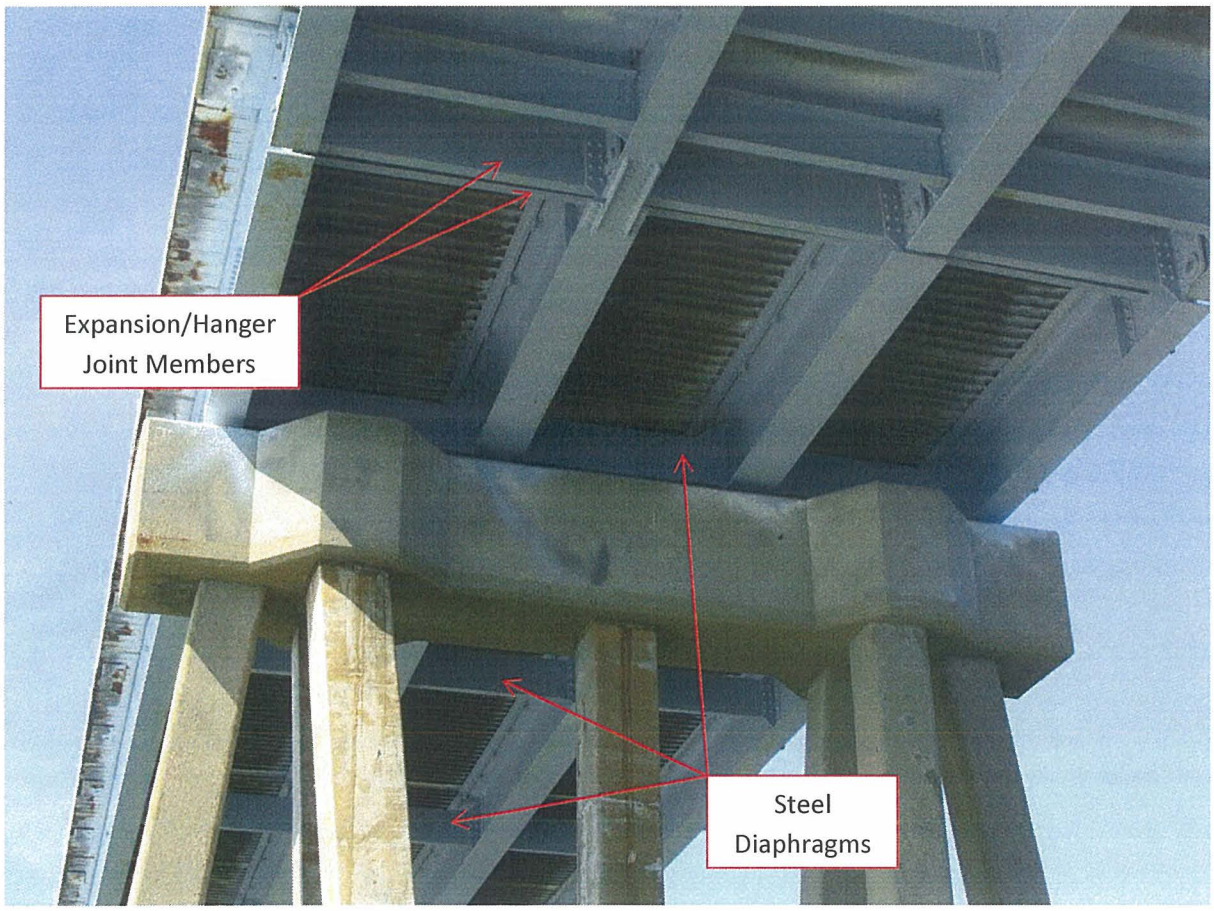

Figure 1

Hanging the conduits beneath the concrete pile caps would compromise the vertical clearance of the bridge above the water and could impede boating activities in these areas of the bridge. This arrangement would likely require additional permits or approvals by the U.S. Army Corps of Engineers and VMRC, in addition to VDOT permits and coordination. If modifications to these bridge components can be made to accommodate the line in a manner satisfactory to VDOT, there are special electrical considerations that must be taken into account when placing cables within carbon steel members. A single phase alternating current (AC) power cable placed inside a carbon steel "loop" will result in a situation where currents are induced in the steel causing significant heating that can very likely result in a cable failure from excessive temperatures in the cable. It is imperative this situation be avoided. Heating problems from induction can be addressed by having all three phases pass through the same magnetic loop.

The conceptual arrangement for the conduits and cables under the bridge deck is shown below in Figure 2:

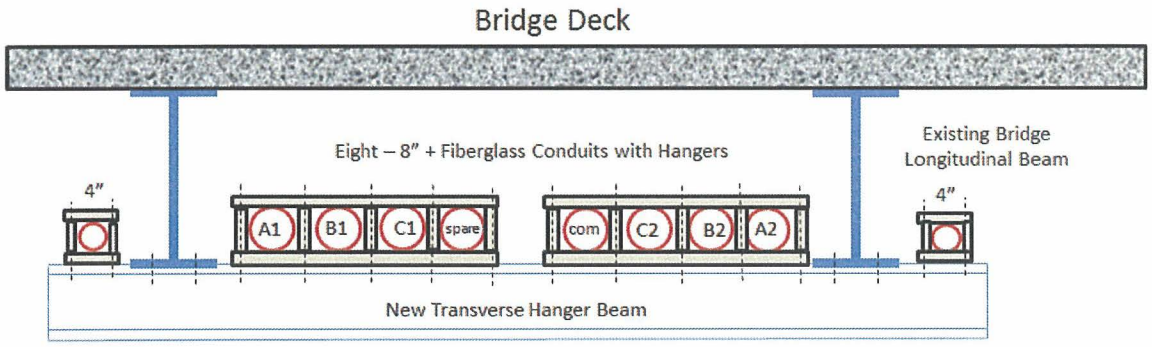

Figure 2

This flat arrangement of the cables provides adequate cooling properties and ensures Dominion's ampacity requirements can be met using two cables per phase. This location also provides shielding from direct sunlight, which would otherwise impact power transfer and contribute significantly to damage of the components from ultra violet light exposure. As shown in the sketch above, the attachment of the new transverse hanger beam is bolted to the flange of the bridge longitudinal beams. An alternate method of attachment that avoids drilling holes in the bridge beam's flange would be more appropriate but would require additional steel members.

Beginning in the girder span sections (approximately 1,500 feet in total length), the conduit system would continue to be supported from the uppermost longitudinal beams. However, the transverse hanger beams would have to be suspended further below the bridge deck to avoid conflicts with other structural members in the bridge.

The conceptual arrangement of the conduits in the girder sections of the bridge is shown in the following Figure 3:

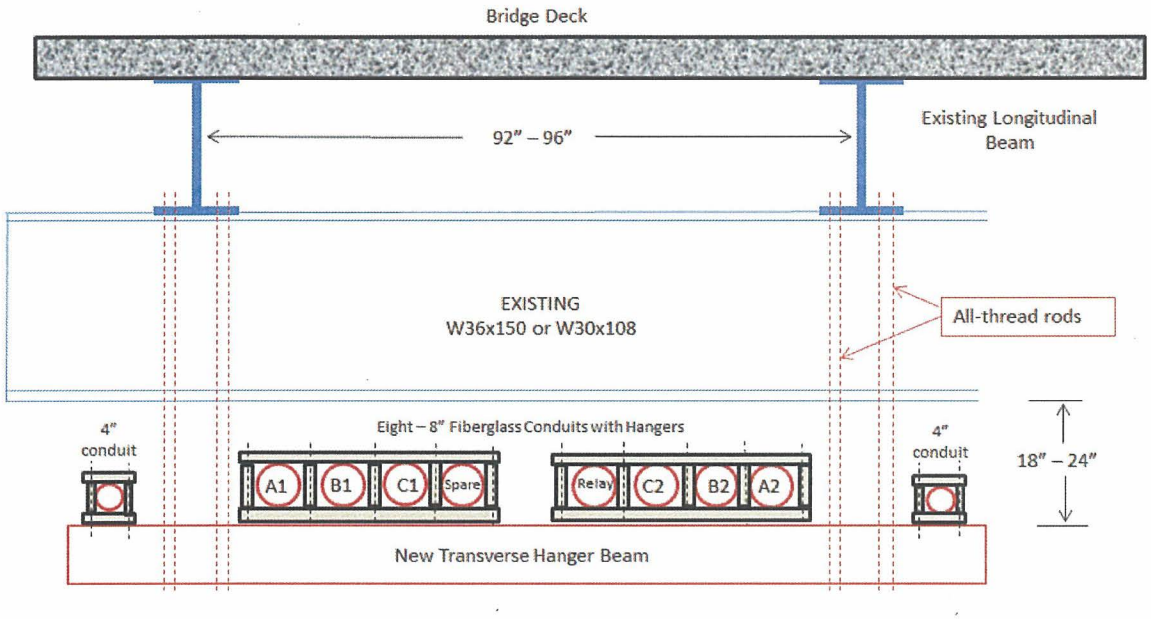

Figure 3

As shown in this sketch, the attachment of the new transverse hanger beam is suspended from all-thread rods bolted to the flange of the bridge longitudinal beams. An alternate method of attachment that avoids drilling holes in the bridge beam's flange could be more appropriate but would require additional steel members.

Additional bracing for the conduit hanging system would be required at various points along the bridge to provide stability. The details of such bracing would be designed based on recommendations from the manufacturers of the conduit hanger system and the cable. This same arrangement would continue along into the truss section of the bridge. There are several different cross-sections of the truss structure to enable the bridge deck to be on top of the truss, in the middle of it and at the bottom of it (center span).

The following photograph (Figure 4) shows the most common cross-section configuration where the bridge deck is positioned on top of the truss:

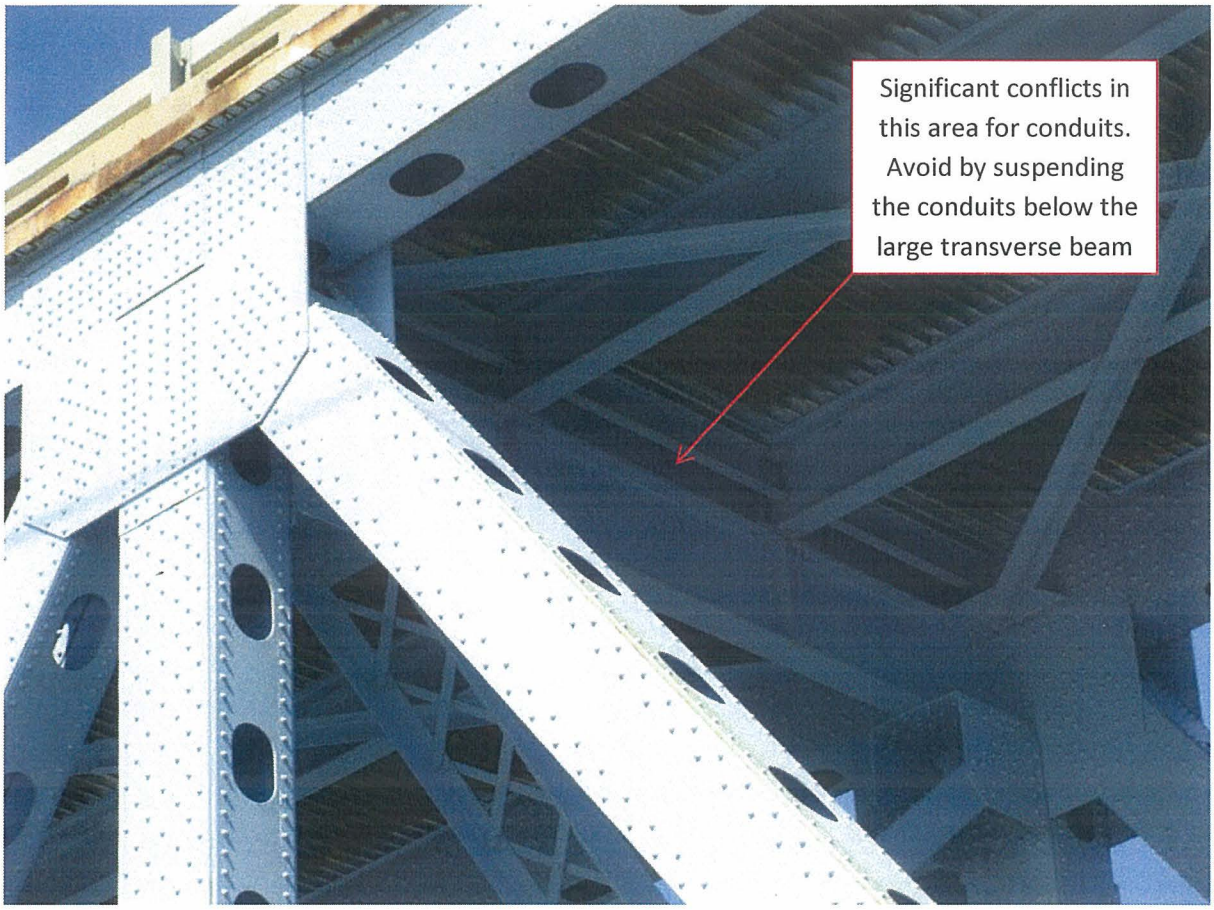

Figure 4

As indicated in the photograph above, there are many obstacles throughout these sections of the bridge that prevent locating the conduit system immediately beneath the bridge deck. Hanging the conduit system below the large transverse beams is the best way to avoid these obstacles.

Below is a sketch (Figure 5) showing the location of the conduits in the truss section where the bridge deck on top of the truss:

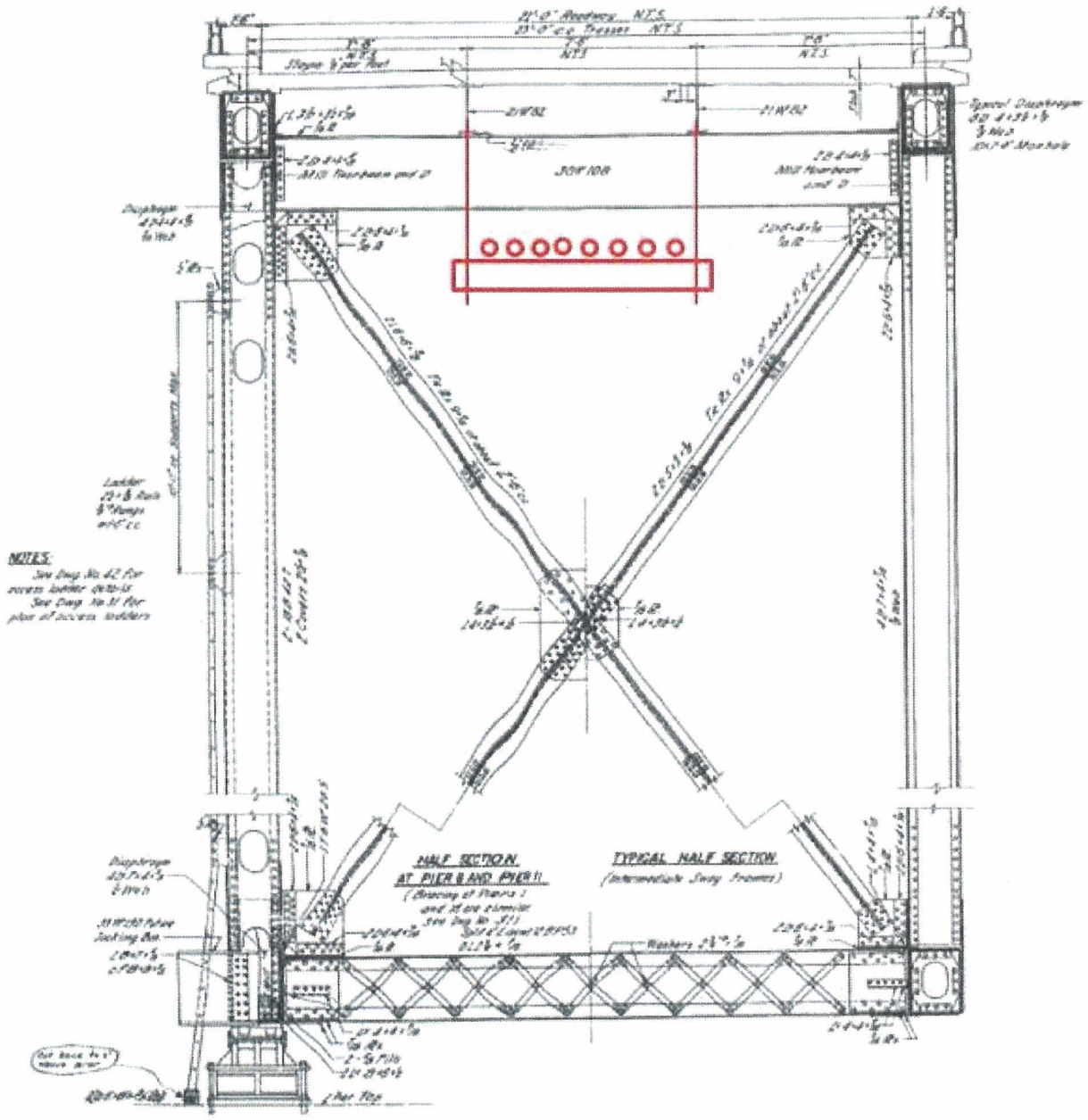

Figure 5

Once the truss cross-section shifts the bridge deck to the bottom, the conduit system suspended from the longitudinal wide-flange beams would be hanging below the lowest parts of the existing structure. This would result in a reduction of the clearance above the water on the order of three (3) to four (4) feet. This reduction would only apply to approximately 300 feet in the center span section. Additional permits from the U.S. Army Corps of Engineers and VMRC may be required for conduits attached to the bridge in this fashion, in conjunction with permitting and close coordination with VDOT.

There are many additional engineering and construction details that must be worked out to successfully install the conduits on the bridge. A primary consideration in the final design would be to accommodate the expansion and contraction of the conduits with the changes in ambient temperature and thermal cycles of the cables due to electrical load. The near-constant vibration of the bridge deck and bridge itself from traffic is another consideration that must be addressed in any final design work.

Once the conduits reach the ends of the bridge, in order to reach the shore there needs to be a transition to a conventional underground duct bank. Bridge abutments typically have a large number of steel H-piles closely spaced so there may not be adequate room to route the conduits through the existing abutment. One potential solution for this transition would be to use a double "S" bend section to swing the conduits horizontally from the center of the bridge to the east. The conduits would then be encased in a concrete envelope which would be supported on driven H-piles. The concrete-encased conduits would then turn downward with a large-radius vertical curve and enter the ground.

Cables used in the shore sections on the north and south ends of the river crossing would be installed in a concrete-encased duct bank. The following diagram (Figure 6) shows Dominion's typical 8-way, 8-inch duct bank used for XLPE cable installations on its underground transmission system:

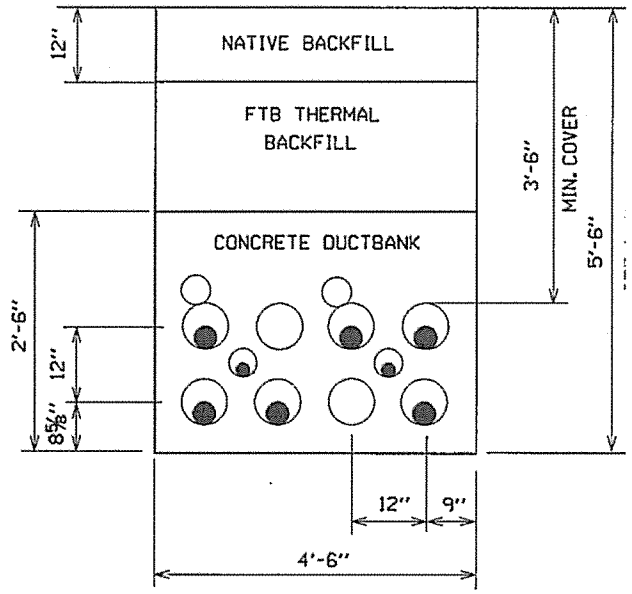

Figure 6

Typical construction methods utilized for duct bank work involve open trenching with large excavators. The trench is temporarily shored with trench boxes to provide a safe working area for personnel to install the conduits and spacers. Once the conduits that are placed into the trench are properly aligned, ready-mix concrete is poured into the trench to provide physical protection and appropriate heat transfer properties around the cables. The trench boxes are then removed and fluidized thermal backfill (FTB) is placed into the trench as needed to provide the proper thermal environment for the cables to operate within design parameters. The National Electrical Safety Code requires that cables of this type and voltage be buried a minimum of 42 inches below the ground surface.

2.1.2 CABLE INSTALLATION CONSIDERATIONS

In addition to the complexities involved in attaching the conduit system to the bridge, there are a number of issues that are involved with installing power cables in the conduits. Expansion and contraction of the cables due to thermal cycling from electrical loads must be coordinated with the expansion and contraction provisions built into the bridge. This issue could play into the

location of cable splicing points in order to avoid excessive mechanical forces on the cable splices. The final design needs to make provisions for "slack" cable across each expansion joint to prevent cable damage. There are also potential issues with cable migration due to the constant slope of the bridge over long distances. This slope coupled with the vibration of the bridge from traffic could cause the cables to "migrate" downhill over time. To avoid excessive tensions in the cables they should be immobilized and secured with robust clamps. The conduits would have to be opened up and the ends secured. Conduit expansion joints would need to be placed in the middle of each section between cable clamping points.

Access to the conduit system from the bridge deck is required for cable installation, cable splicing and subsequent inspections and testing over the life of the system. Currently there are no access points on the existing bridge. An access arrangement acceptable to VDOT would have to be installed by cutting the bridge deck and installing removable covers that would be bolted in place. Traditional manhole covers would not be recommended as they can sometimes "rattle" in their frames as traffic crosses them and make excessive noise. A securely bolted cover plate would mitigate this potential noise problem.

There is also a need to install permanent cable splicing platforms under the bridge deck at each point where the 230kV cable sections would have to be joined together. This typically takes place about every 2,000 feet. In typical land-based installations manholes are installed to facilitate cable splicing. These platforms would take the place of the manholes for the bridge installation. The structural components of the splicing platform would need to be designed to withstand the mechanical forces that may occur during cable pulling and also during thermal cycling of the cable from electrical load. The cable on each side of a splice must be completely immobilized to prevent damage to the splice from forces expected under normal operating and fault conditions.

Due to the amount of time and difficulty involved in locating and repairing a cable failure, Dominion has requested a seventh, spare cable be installed. If a failure occurs, Dominion would isolate the faulted cable, connect the spare to the appropriate points and then re-energize the circuit. The damaged cable, isolated from the electrical system, could then be further analyzed and repaired or replaced in a safe manner with less jeopardy to reliability.

The weight of the cable system must be considered when attaching it to the bridge. Below is a summary of the various components of the conduit and cable systems and their corresponding weights that would be attached to the bridge:

Component	Quantity	Unit Weight/ft. (lbs.)	Total Weight/ft. (lbs.)
230kV XLPE Cable	7	17.4	121.8
Continuity Conductors	2	1.69	3.38
8" Fiberglass Conduit	8	2.42	19.36
4" Fiberglass Conduit	2	0.92	1.84
Transverse Hangers	1 every 12 feet	37.00	32.00
Hanger Brackets	1 every 12 feet	48.40	4.33
TOTAL			**182.71 lbs/ft**

For the 10,000-foot length of the bridge, this amounts up to a total additional weight attached to the bridge of 1,827,100 pounds. This is a significant amount of loading that has a negative impact on the bridge. According to a preliminary analysis performed by VDOT bridge engineers, the significant additional weight on the bridge would reduce the posted load limits for single rear axle vehicles from 25 tons down to 21 tons, and for multiple rear axle vehicles from 40 tons down to 25 tons. These limits would prevent traffic by certain types of vehicles, including commercial and emergency vehicles that currently use the bridge. Dominion has requested VDOT's formal input on this and other issues through a letter dated October 14, 2016.

2.2. CABLE AMPACITY REQUIREMENTS

Dominion provided PDC with the cable electrical loading requirements for the circuit in order to perform analysis to determine the required conductor size. Dominion specified the cable needed to be designed for 230kV operation with initial operations at 115kV. The required ampacity of the cable system attached to the bridge was specified by Dominion to be 2299 Amperes. PDC performed calculations based on known conditions and generally accepted assumptions. These calculations showed that two 3500 kcmil copper conductors per phase would be appropriate for this installation.

The following cable diagram (Figure 7) shows the typical construction of a cable suitable for installation on the bridge and in the concrete-encased duct bank on land:

Diagram provided by Southwire

1 – copper conductor	6 & 8– water swellable semi-conducting tape
2 – semi-conductive tape	7 – 41 x #12 AWG aluminum concentric wires
3 – conductor shield	9 – Laminated copper foil moisture barrier tape
4 – XLPE insulation (906 mils)	10 – HDPE outer jacket
5 – Insulation shield	11 – Semi-conducting outer layer

Figure 7

2.3 CONSTRUCTION REQUIREMENTS

PDC made a field visit to the bridge specifically to review construction aspects and potential duration to complete the work. Experienced contractors provided input as to the construction duration requirements. PDC reviewed specific equipment sizes and weights to determine anticipated impacts on the bridge and traffic across the bridge.

For the conduit installation, it would be anticipated that "snooper" trucks would be used to provide access to the bridge beneath the deck. Snooper trucks provide an articulating arm lift and are regularly used by VDOT for inspection and maintenance efforts throughout the state. Use of this lift would require a single lane closure on the bridge. The conceptual schedule developed to estimate the durations of major construction activities included seven months to get the conduits and hangers installed on the bridge. Assuming a four-day work week, this amounts to approximately 115 days in which a lane of traffic on the bridge would be shut down to traffic. There are significant costs associated with such lane closures. Traffic control expenses alone would approach or exceed approximately $325,000 based on recent costs Dominion encountered during a recent lane closure for an inspection of the existing overhead line attached to the bridge. Additional lane closures would be needed to install the access covers required for cable installation along with the installation of the steel for the splicing platforms at each splice

location. With four splice locations anticipated on the bridge, another 60-70 days of lane closures would be necessary.

Because of the size and weight of the reels for 2,000 feet of 230kV cable, equipment required to accommodate the reels is also large and heavy. For example, the trailer used to haul a cable reel to the pulling point and support the reel during the cable pulling operation is 13 feet wide and weighs approximately 25,000 pounds (excluding the 22,000-pound road tractor required to pull it). The total weight, including nearly 40,000 pounds for cable, approaches 97,000 pounds and exceeds the current posted rating of the Norris Bridge. The following photograph, Figure 8, shows a typical XLPE cable reel set-up for cable pulling. The width of the reel trailer is 13 feet.

Land-based Cable Pulling – Reel Trailer Set Up

Figure 8

The large reel trailer presents a very significant impediment for handling traffic on the bridge. Each of the two lanes is only 11 feet wide, so a single lane cannot accommodate the cable reel trailer. There are no shoulders on the Norris Bridge to help accommodate this large construction equipment. Therefore, during cable pulling setup and actual cable pulling operations, a complete shutdown of the bridge would be required. It may be possible to accomplish some of the preparation for a cable pull with only a single lane closed; however, the bridge would need to be closed for a continuous 5-8 hours for each of the 35 cable sections installed on the bridge. This means there would essentially be five weeks of complete closure of the bridge to all traffic, including commuter, tourist, commercial, and emergency vehicles.

After cables are pulled into place, splicing operations would commence. Single lane closures would be required for the vehicles and supporting equipment used. It would take approximately three months to complete the splices located on the bridge. Assuming a four-day work week, an additional 48 days of lane closures on the bridge would be required.

2.4 ENVIRONMENTAL ASPECTS OF THE BRIDGE ATTACHMENT OPTION

The bridge attachment cable option requires the installation of a concrete encased duct bank from the overhead-to-underground transition stations on each side of the river up to the ends of the bridge. The trench would be a minimum of 4.5 feet wide by 5.5 feet deep. Each foot of trench would require the excavation of 0.75 cubic yards of native soil. For the southern land section approximately 1,100 feet long, 825 cubic yards of material would need to be disposed of offsite. For the northern land section (1,200 feet in length) another 900 cubic yards of material would be removed. This is a total of 1,725 cubic yards of soil. The average commercial dump truck holds 10-14 cubic yards of material. The amount of soil to be hauled off and disposed of in a proper manner equates to approximately 120 to 170 dump truck loads.

The details of the environmental aspects of the bridge attachment option are described in the Alternatives Analysis filed simultaneously with this report.

2.5 CONSTRUCTION SCHEDULE OVERVIEW

In coordination with input from experienced contractors, PDC developed a construction schedule based on the conceptual arrangement. An overview of the major activities included in the conceptual schedule is shown below:

Conduit and Splice Platform Installation	8 months
Duct Bank (land) Installation	2 months
Cable Pulling	4 months
Cable Splicing	3 months
Cable Termination	0.75 months
Total Duration *	**14 months**

* Certain activities overlap which reduces the overall duration.

The durations in the schedule are based on a work week comprised of four ten-hour days. If VDOT permits work only between 9 a.m. and 3 p.m., the overall duration of the schedule would increase significantly. Dominion's current environmental permits contain time-of-year restrictions on construction due to the presence of certain endangered species in the area of the bridge. If the same restrictions were placed on construction of "Barnhardt Option 1," that could have significant impacts on the overall duration to complete the work. These restrictions could also impact the overall installation costs if all work is shut down for extended periods and the contract personnel are pulled off the project.

The delivery lead time for high-voltage XLPE cables is currently running about 4-5 months. This material procurement schedule fits the conceptual construction schedule set forth above without becoming a critical path item (i.e., creating additional schedule delay).

2.6 ESTIMATED COSTS OF THE BRIDGE ATTACHMENT OPTION

In order to develop an accurate estimate of the cost to install a cable system as described in this report, PDC contacted suppliers and contractors with demonstrated capabilities in manufacturing and installation services required for projects of this type. For all major components (i.e., fiberglass conduit, conduit hanger brackets, 230kV power cable, cable splices, cable terminations, ground continuity conductors and labor for the installation), PDC provided the contractors with a general scope of the work and/or the material requirements and requested current pricing information.

Dominion used the collected information to develop comprehensive estimates for each alternative PDC investigated. The Dominion estimates provide cost information on other

common project activities in addition to labor and materials; engineering, project management, permitting, right-of-way acquisition, legal, etc. Based on this information and process, the total cost estimate for the installation of cables on the Norris Bridge was calculated to be approximately $35.0 million. This amount excludes any amount needed for bridge enhancements necessary to make the Norris Bridge able accommodate the transmission cables to carry the required amount of load for Barnhardt Option 1. The Company has requested this information from VDOT.

2.7 OPERATIONS AND MAINTENANCE REQUIREMENTS FOR DOMINION

Transmission cables systems are not maintenance free. Various components of the cable system require routine maintenance. Schedules differ for the various components. Maintenance activities range from visual inspections to in-depth electrical tests. The most frequent inspection would be a visual inspection of the cables and accessories. Dominion's current maintenance practices for land-based cable circuits involve weekly inspections of cable route and terminals. Cable route inspections are focused on preventing third-party "dig-ins" that damage cables. Termination inspections focus on looking for signs of dielectric fluid losses that can be an indication of potential trouble within the terminations. Manholes and cable splices are inspected on a 5-year cycle for XLPE cable systems. Consistent with industry practices, Dominion's work and safety practices do not permit personnel to enter a manhole that has energized XLPE cable splices. For an installation of cables on the Norris Bridge, splices would need to be inspected on a more frequent basis in the early life of the cables to ensure there are no unanticipated conditions associated with the atypical installation. The frequency of inspections may be reduced over time if the system displays no adverse effects due to cable or bridge movement or vibration from the bridge. It would be prudent to perform initial inspections at six months and then again at one year after installation and energization. Based on the findings of those inspections, the frequency of subsequent inspections could be reduced; however, the cable system should be inspected every two years at a minimum.

A cable jacket integrity test is recommended for this installation every five years. This test will detect holidays (voids) in the cable jacket that could compromise the cable sheath bonding scheme and could lead to corrosion of the cable's moisture barrier.

All of these inspections mentioned above would likely require a single lane closure on the bridge to facilitate access to the cable system and an outage on the cables for safety of personnel. Most of these inspections could be done in a single workday. The jacket integrity testing could potentially take several days to complete for the entire crossing. The jacket integrity testing requires an outage because the sheath bonding leads must be lifted to perform the testing and it

is not safe to lift these leads on an energized cable. In addition, lifting the sheath bonding leads on an energized cable could result in damage to the cable.

Additionally, at least once per year an inspection of the overall conduit system attached to the bridge should be made from a boat. This inspection should focus on the condition of the conduits and the integrity of the bridge attachment hardware.

2.8 IMPLICATIONS FOR VDOT'S BRIDGE OPERATIONS AND MAINTENANCE

Dominion and PDC met with representatives of VDOT and discussed the potential installation of transmission cables and conduit on the Norris Bridge. VDOT expressed some concerns about the impact on bridge operations and maintenance activities with such a utility attachment. First and foremost, there was concern about the ability of the bridge to support the additional weight of the conduits and cable system. As noted earlier in this report, the additional weight on the bridge would be approaching 2 million pounds. VDOT performed a preliminary analysis based on an initial weight per lineal foot of 156 pounds for the cable system. With this additional loading, VDOT engineers determined the posted load rating of the bridge would be reduced by as much as 38%. After further analysis and accounting for all the components required to get the cables attached to the bridge, the weight loading has increased to 182.71 pounds per foot. This represents a 17% increase in the overall weight added to the bridge and may result in additional reductions in VDOT's posted load ratings for the Norris Bridge or required enhancements to the bridge at Dominion's expense.

Based on preliminary review, VDOT personnel indicated there would be long term implications affecting their ability to do inspections of the bridge with the cables attached to it. They also raised concerns about the cables impacting their ability to perform maintenance such as painting on the bridge. One thing to note is that most bridge inspection and maintenance activities would require an outage on the cables for personnel safety considerations just as exists today for the current line. It would be appropriate for Dominion to take the cables out of service whenever bridge workers are under the bridge deck in proximity to the cables.

3.0 OVERVIEW OF A SUBMARINE CABLE INSTALLATION (Barnhardt Option 2)

In this alternative prescribed by the SCC Hearing Examiner, underground transmission cables would be installed "in a shallow trench across the river in conjunction with horizontally drill pathways from the north and south banks traversing the shallow depths adjacent to the banks." For an underground transmission cable to be installed in a submarine environment such as this, cables are specially designed to accommodate the very different construction techniques than conventional land-based cables. For example, each single-phase cable would need to be supplied in one continuous length in order to eliminate splices that would be underwater. Such splices could be problematic from a long-term reliability viewpoint. Submarine cables also require additional reinforcement or armoring to protect the cable from damage during installation and from external forces such as river currents or anchoring damage. The submarine cable design will be discussed in more detail later in this report.

Like the bridge attachment crossing in Barnhardt Option 1, there would also be land sections of cable on each side of the river from the shoreline to the transition station. Conventional open-cut trenching techniques would be anticipated to install a concrete-encased duct bank in these sections. Near the shoreline there would be splice points with manholes to transition from the submarine cables to conventional land cables. This area is also where the transition to HDD conduits to the duct bank would be made. Conduits would be installed from the transition splice area out into the river bottom to a point beyond the oyster lease areas. This is a distance of approximately 1,000 feet. The submarine cables would then exit the HDD conduits and then be directly embedded in the river bottom until reaching the opposite shore. The process of landing the cables on the opposite shore would be similar to the landings on the starting shore.

Dominion has also requested there be a total of seven cables for this submarine cable option for reliability reasons. The cables would be configured to operate with two cables for each of the three alternating current phases and there would be one spare cable. The spare cable would be energized from one end, but not connected to the circuit on the other end. This keeps the cable energized but it does not carry and load current. This is a common utility practice on submarine cable circuits to expedite restoration in the event of a cable failure.

3.1 INSTALLATION OF SUBMARINE CABLES ACROSS THE RIVER (BARNHARDT OPTION 2)

3.1.1 INSTALLATION OF CONDUITS AT THE SHORE ENDS OF THE CROSSING

As in Barnhardt Option 1, the cables on land between the overhead-to-underground transition station and the shoreline would be installed in a concrete-encased duct bank. Typical construction methods utilized for duct bank work involve open-cut trenching with large excavators. The trench is temporarily shored with trench boxes to provide a safe working area for personnel to install the conduits and spacers. Once the conduits placed into the trench are

properly aligned, ready-mix concrete is poured into the trench to provide physical protection and good heat transfer around the cables. The trench box shoring is then removed and fluidized thermal backfill (FTB) is placed into the trench as needed to provide the proper thermal environment for the cables to operate within design parameters. The National Electrical Safety Code requires that cables of this type and voltage be buried a minimum of 42 inches below the ground surface. The duct bank would be the same configuration shown in Figure 6 in Section 2.1.1.

Manholes would be placed near the shoreline to splice the land cables to the submarine cables. At this point the individual 8-inch conduits in the duct bank would fan out to tie into the conduits installed by HDD methods. The depth of the HDD conduits would be determined based on design requirements of drill path. Detailed engineering and soil analysis is required to determine how the drilling would be done. One scenario to accomplish this would be to position the drilling rigs on a platform or anchored barge in the river near the planned exit point of the drill path. The drill would then establish a pilot hole over to the shoreline area and exit the ground. After reaming the pilot hole to a suitable diameter, a 10-inch HDPE conduit would subsequently be pulled into the drill hole. Another method would be to position the drill rigs on land near the shoreline and drill the pilot hole from land to the exit point underwater. There would be a "receiving pit" excavated in the river bottom. Turbidity curtains would then be installed around the receiving pit to capture the drilling mud used in the HDD process. Once the drill rig reaches this pit, the drilling mud would be pumped out the containment area inside of the turbidity curtains. A 10-inch HDPE conduit would then be pulled back through the drill path.

Finalizing the approach to accomplish the transition from installing the submarine cables in the HDD conduits to embedding the submarine cables in the river bottom requires significant coordination between the various contractors involved in a project of this type. One likely method would be to excavate the river bottom to reach the "river" ends of the HDD conduits and extend that excavation out for as much as 100 feet to a point where the submarine cables would be buried by a water-jet plow. These transition excavations in the river bottom were estimated to be 25 wide by 100 feet long and would need to reach the depth of the "river" end of the HDD conduits. Much of these transition excavations would already be in place as the "receiving pits" if the HDD work were done with the drills positioned on land.

The following diagram (Figure 9) depicts the conceptual layout of the conduit system for the HDD shore approaches:

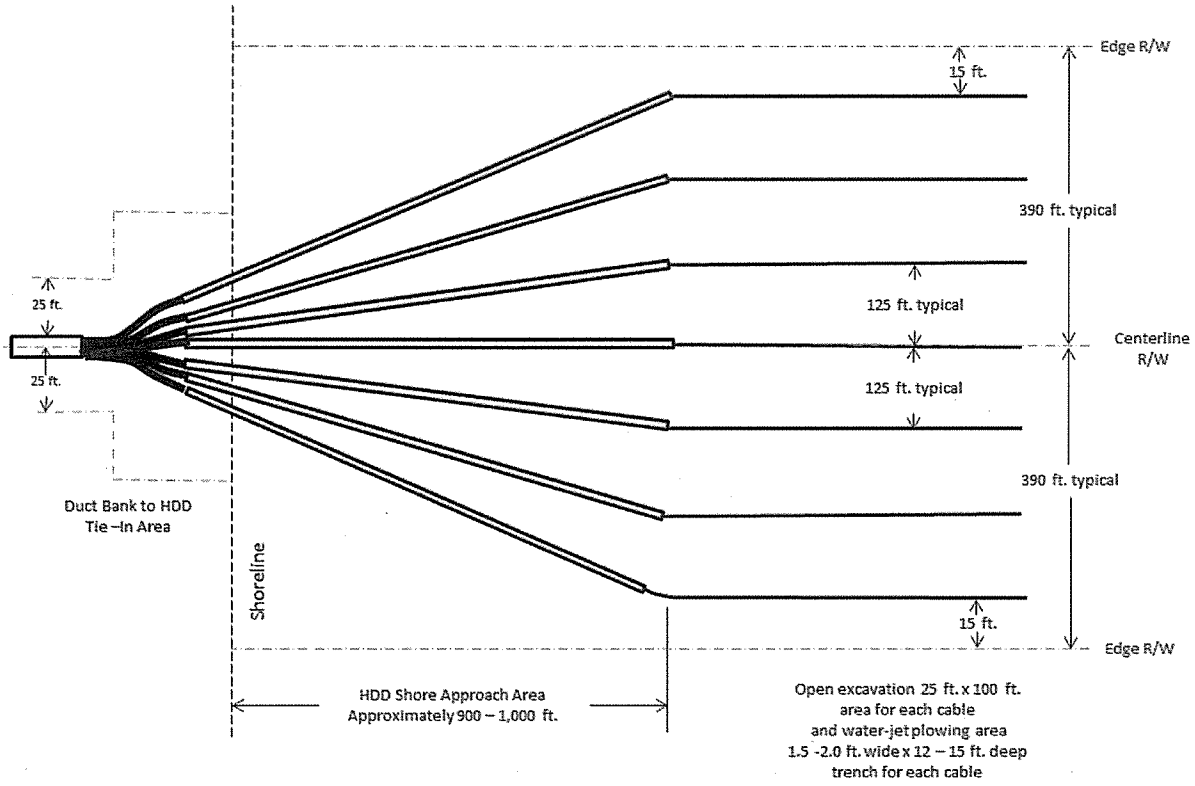

Figure 9

The tie-in area where the conduits fan out from the duct bank (4.5 feet wide) to the HDD conduits (10-foot centers totaling 60 feet wide) would require multiple open excavation trenches to install the conduits. These tie-in area conduits would also be encased in concrete and the trenches backfilled with FTB and some native soils.

3.1.2 LAYING AND BURIAL OF THE SUBMARINE CABLES

Once the conduits have been installed and readied to cable installation, a cable laying vessel would navigate to the "river" end of the first HDD conduit. One end of a submarine cable length would be payed off the vessel and threaded into the HDD conduit. Using a previously installed pulling line, the submarine cable would be pulled to the shore manholes approximately 1,000 feet. The laying vessel would then proceed to cross the river laying cable as it moves along the route. The laying vessel would proceed across the river towards the opposite shore to a location near the exit point of the HDD conduits as shown in Figure 10.

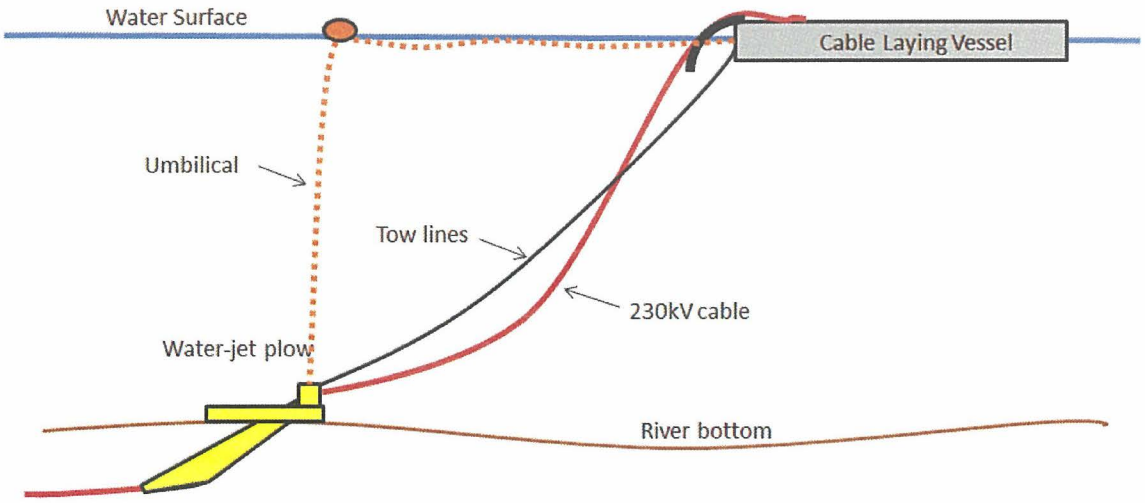

Figure 10

The remaining length of the submarine cable would then be payed off the vessel with floats attached. This 1,000-foot length of cable would then be maneuvered to get the end in position to thread into the "river" end of the HDD conduit. Again, using a previously installed pulling line, the submarine cable would be pulling into the HDD conduit to the shoreline manhole. Depending on the results of a marine study, each cable may be laid and buried in a single pass or it may take two separate passes, i.e., a laying pass followed by a burial pass. A water-jet plow would be towed by the vessel and bury the cable in the river bottom. An embedment depth of 3 to 5 meters (10 to 15 feet) is recommended for submarine installation such as this one. This process would then be repeated for the six remaining submarine cables. The cables would be spaced approximately 125 feet apart for several reasons. First, adequate separation between cables would be necessary to prevent damaging a previously laid cable when installing the other cables. There is also the need to account for excess cable lengths that would be generated in a failed cable repair procedure. The general approach to accommodate excess cable after a repair is to layout the cables at twice the maximum water depth. In this crossing, the deepest water encountered is just over 60 feet, so a spacing of 125 feet is appropriate.

3.2 CABLE AMPACITY REQUIREMENTS

Dominion provided PDC with the cable electrical loading requirements for the circuit in order to perform an analysis to determine the required conductor size. Dominion specified the cable needed to be designed for 230kV operation but would initially be energized at 115kV. The

required ampacity of the cable system attached to the bridge was specified by Dominion to be 1707 Amperes. PDC performed calculations based on known conditions and generally accepted assumptions. These calculations showed that utilizing two 800 mm^2 (1,579 kcmil) copper conductors per phase would be appropriate for the submarine cable portion of the crossing. The underwater cables would be of an armored submarine cable type. The land sections of cable would be the same size and design as the land cable sections discussed in Barnhardt Option 1.

The following cable diagram (Figure 11) shows the typical construction of a submarine cable with steel wire armoring suitable for burial in the river bottom:

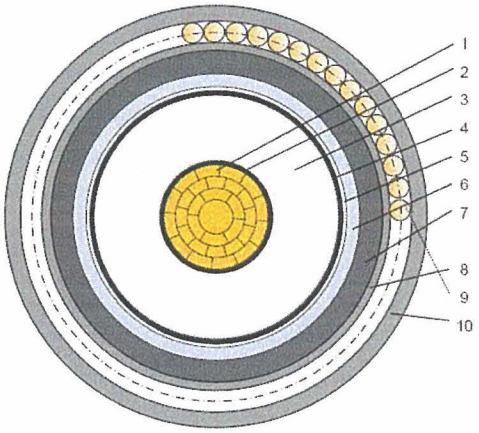

Diagram provided by
LS Cable & System Ltd.

1 – copper conductor	**6 – lead alloy sheath**
2 – conductor shield	**7 – semi-conducting polyethylene**
3 – XLPE insulation (790 mils)	**8 – polypropylene yarn with bitumen**
4 – Insulation shield	**9 – copper wires with bitumen**
5 – water swellable semi-conducting tape	**10 - polypropylene yarn with bitumen with black & yellow stripe**

Figure 11

3.3 SUBMARINE CABLE CONSTRUCTION REQUIREMENTS

As noted in Section 3.1.2 above, the installation of the submarine cable portion of this crossing would be accomplished using a cable laying vessel such as a specialized cable laying ship or a barge configured for cable laying. There are additional studies that must be performed to determine the appropriate methods to lay and embed the cables into the river bottom. Good engineering practice is to embed at a reasonable depth into the river bottom to prevent damage from third parties. One of the most common failure modes for submarine cables is damage from anchors. Most water jet plows used in this type of work have the ability to bury the cables in the range of 3 to 5 meters (10 – 15 feet). Shallower burial depths increase the probability of cable

damage and would not be recommended for this crossing. Under ideal conditions, it would take approximately three weeks to lay and bury the cables.

Once of the highest risk stages of this work would be when the cables are maneuvered into the end of the HDD conduits and pulled to the transition splice manholes. Care must be taken to make sure the cables are well-controlled and not permitted to bend or kink which would cause damage. A submarine cable appropriate for this project weighs 40 pounds per foot in air. Its weight in water is somewhat less, but it remains quite heavy and difficult to pull long distances in conduit compared to overhead cable pulls.

Once each cable has been laid across the river to the other shore, the end of the cable has to be payed off the vessel. Floats would be attached to the entire section of cable (approximately 1,000 feet long). This would enable the section to be positioned for pulling it into the HDD conduits. Once the trailing end is threaded into the HDD conduit, the pulling process would begin and each float would be cut loose from the cable just before getting pulled underwater near the end of the HDD conduit. Again, care must be taken to avoid bending the cable tighter than the manufacturer's recommended minimum radius for installation.

After the submarine cables are pulled to the transition splice manholes, the submarine cable armor wires would be attached to specially designed "armor clamps" to secure the cable armor. The armor clamps would be secured to a robust concrete foundation in the ground to restrict movement of the cables. The submarine cable armor wires are also electrically bonded to ground at this location.

As with Barnhardt Option 1, there are sections of land cable on each side of the river. Land cables would be pulled into a concrete-encased duct bank from the transition manholes to the overhead-to-underground transition station. The duct bank construction activities would be the same as in Barnhardt Option 1. The submarine cables would be spliced to land cables in each transition manhole. Two transition manholes would be anticipated on each side of the river. There would be a total of 14 transition splices for this crossing. In each of the overhead–to-underground transition stations, 14 cable terminations would be installed to complete the cable system installation.

3.4 ENVIRONMENTAL ASPECTS OF THE SUBMARINE CABLE OPTION

The installation of the land sections of this crossing would have the same impacts as the land sections in the bridge attachment option. The land cable sections require the installation of a concrete encased duct bank from the overhead-to-underground transition stations on each side of the river up to the transition splice manholes near the shoreline. The trench would be a

minimum of 4.5 feet wide by 5.5 feet deep. Each foot of trench would require the excavation of 0.75 cubic yards of native soil. For the southern land section approximately 1,100 feet long, 825 cubic yards of material would need to be disposed of offsite. For the northern land section (1,200 feet in length) another 900 cubic yards of material would be removed. This is a total of 1,725 cubic yards of soil. The average commercial dump truck holds from 10 to 14 cubic yards of material. The amount of soil to be hauled off and disposed of in a proper manner equates to approximately 120 to 170 dump truck loads.

The details of the environmental aspects of the submarine cable option are described in the Alternatives Analysis filed simultaneously with this report.

3.5 CONSTRUCTION SCHEDULE OVERVIEW

The delivery lead time of specialty submarine cables is longer than for standard cable. Current estimates for delivery of submarine cables are running about 10 – 12 months after a purchase order and cutting lengths are issued. The current lead time for the land cables manufactured in the USA is significantly shorter at approximately 4 - 5 months. Transit time to the project site also plays into the schedule as submarine cables would be manufactured either in Asia or Europe. High-voltage XLPE cable for the land sections would also need to be manufactured by the vendor supplying the submarine cable sections in order for the overall cable system to be provided with a warranty.

An overview of the major activities included in the conceptual schedule is shown below:

Manufacture and deliver Submarine & Land Cables	10 – 12 months
Submarine Cable Laying and Burial	1 month
HDD conduit installation	4 months
Duct Bank (land) Installation	2 months
Land Cable Pulling	1 month
Cable Splicing	1 month
Cable Termination	0.75 months
Total Duration *	**13 - 15 months**

* Certain activities overlap which reduces the overall duration

These durations are based on a 24/7 around-the-clock operation for the submarine cable laying and burial activities. The other cable work durations are based on 12 hours per day, six days per week. Duct bank installation would likely be accomplished in advance of the cable installation with work performed 8 hours per day, five days per week.

Again, it should be noted that some of the environmental permits have "time of year"

restrictions that could have significant impacts on the overall duration to complete the work. These restrictions could also impact the overall installation costs if all work is shut down for extended periods and the contract personnel are pulled off the project.

3.6 ESTIMATED COSTS FOR THE SUBMARINE CABLE OPTION

In order to develop an accurate estimate of the cost to install a submarine cable system as described in this report, PDC contacted suppliers with demonstrated capabilities in manufacturing and installation services required for projects of this type. They were provided a general scope of the work and/or the material requirements and requested to provide current pricing information. The general approach would be to utilize a "turn-key" contract for the cable and accessories acquisition along with the installation services. The civil work for installation of the duct banks on each land section would typically be done using local vendors qualified to do this type of work.

Once these estimated costs were received, PDC provided them to Dominion to input into their cost estimating software. Dominion used this information to develop comprehensive estimates for each alternative PDC investigated. The Dominion estimates provide cost information on other common project activities in addition to labor and materials; engineering, project management, permitting, right-of-way acquisition, legal, etc. The total cost for the installation of a submarine cable system across the Rappahannock adjacent to the bridge is approximately $92.3 million.

3.7 OPERATION AND MAINTENANCE REQUIREMENTS FOR DOMINION

Like the land based cable systems that Dominion currently has in its transmission system, a submarine XLPE cable would also require some periodic maintenance. Maintenance activities range from visual inspections to in-depth electrical tests. Schedules differ for inspections and maintenance of the various components. The most frequent inspection would be a visual inspection of the cables and accessories. Dominion's current maintenance practices for land-based cable circuits involve weekly inspections of cable route and cable terminations. Cable route inspections are focused on preventing third-party "dig-ins" that damage cables. Termination inspections focus on looking for signs of dielectric fluid losses that can be an indication of potential trouble within the terminations. Manholes and cable splices are inspected on a 5-year cycle for XLPE cable systems. It should be noted that Dominion's work practices do not permit personnel to enter a manhole that has energized XLPE cable splices. This is for personnel safety and lines up with industry-wide utility practices. Outages of the circuit are required for manhole and splice inspections.

The submarine portion of the crossing cannot be easily inspected due to the burial depths in the river bottom. Underwater inspection equipment should be used periodically to investigate any river bottom scouring that may occur over time. It is not desirable to have any portion of the cable in suspension from the river bottom materials being removed by water currents. The frequency of such inspections should be determined based on a study of the soil conditions along the cable route and along with the impact of river currents.

The land sections of cable should also be subjected to a jacket integrity test every five years. This test will detect holidays (voids) in the cable jacket that could compromise the cable sheath bonding scheme or could lead to corrosion of the cable's moisture barrier. This test will require a complete outage of the cable system. The jacket integrity testing also requires the sheath bonding leads to be lifted. It is not safe to lift these leads on an energized cable. Lifting the sheath bonding leads on an energized cable could also result in damage to the cable.

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Amanda M. Mayhew

Title: Senior Siting and Permitting Specialist

Summary:

Company Witness Amanda M. Mayhew testifies regarding the anticipated and additional permitting requirements for Barnhardt Options 1 and 2. She provides an update regarding the U.S. Army Corps of Engineers ("Army Corps") permit for the Company's Proposed 115 kV Overhead Route. Ms. Mayhew also co-sponsors the Supplemental DEQ Supplement with Company Witness Jon M. Berkin.

Ms. Mayhew testifies that for Barnhardt Option 1, the Company would be required to submit a Joint Permit Application ("JPA") to the Army Corps, the Virginia Marine Resources Commission ("VMRC") and the local wetlands board in Middlesex County. Additionally, the transition stations required at both ends of the river crossing entail multiple applications and approvals as well. Lastly, the Company would require a new VDOT permit to be attached to the Norris Bridge, and coordination with VDOT for construction purposes. Ms. Mayhew's supplemental direct testimony provides further detail on each of these items.

For Barnhardt Option 2, Ms. Mayhew explains Dominion Virginia Power would be required to submit a JPA to the Army Corps, VMRC, and local wetlands board, and also seek necessary approvals associated with transition station permitting. In addition, if the Army Corps determined that Barnhardt Option 2 did not qualify for a Nationwide Permit, it could require an Individual Permit. Finally, the Company would need to address impacts to private and public oyster beds and obtain a Construction General Permit for the on-land trenching. Ms. Mayhew's supplemental direct testimony provides further detail on each of these items.

Finally, Ms. Mayhew testifies that while the Company's existing Nationwide Permit and VMRC approval for the 115 kV Overhead Route have upcoming expiration dates, the Company is reasonably confident that it could complete the necessary work for the proposed configuration prior to the deadlines if Commission approval is gained in time to commence work in July of 2017.

SUPPLEMENTAL DIRECT TESTIMONY
OF
AMANDA M. MAYHEW
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Amanda M. Mayhew, and I am a Senior Siting and Permitting Specialist for Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company"). My office is located at One James River Plaza, 701 East Cary Street, Richmond, Virginia 23219.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted pre-filed direct testimony on behalf of Dominion Virginia Power to the State Corporation Commission of Virginia ("Commission") on February 29, 2016 in this proceeding in support of the Company's proposal to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9 mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project"). The Company's proposal included constructing 10 galvanized steel H-frame structures in the water approximately 100-feet east of the Norris Bridge ("Proposed 115 kV Overhead Route").

Q. What is the purpose of your supplemental direct testimony?

A. The purpose of my supplemental direct testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016, which directed the Company to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii)

installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow depths adjacent to the banks ("Barnhardt Option 2").

Specifically, I will testify regarding the anticipated and additional permitting requirements for Barnhardt Options 1 and 2. I provide an update regarding the U.S. Army Corps of Engineers ("Army Corps") permit for the Company's Proposed 115 kV Overhead Route. I also co-sponsor the Supplemental Department of Environmental Quality ("DEQ") Supplement with Company Witness Jon M. Berkin.

Q. Beginning with Barnhardt Option 1, what approvals, other than from the Commission, would the Company need to obtain to construct this configuration of the Rebuild Project?

A. Dominion Virginia Power would be required to submit a Joint Permit Application ("JPA") to the Army Corps, the Virginia Marine Resources Commission ("VMRC") and the local wetlands board in Middlesex County for the river/wetlands impacts of Barnhardt Option 1. Additionally, the transition stations required at both ends of the river crossing for Barnhardt Option 1 entail multiple applications and approvals as well. Lastly, the Company would require a new Virginia Department of Transportation ("VDOT") permit to be attached to the Norris Bridge, and coordination with VDOT for construction purposes.

<u>River/Wetlands Impacts</u>

Before submitting the JPA, there must first be a determination by the Army Corps that the configuration of Barnhardt Option 1 below the bridge deck meets vertical clearance

requirements.

Specifically, Barnhardt Option 1 would require hanging conduits beneath the concrete pile caps of the bridge, which would reduce the vertical clearance of the bridge above the water and could impede boating activities. Vertical clearance of transmission lines over navigable water is defined in 33 CFR 322.5(i.) (Special policies-Power transmission lines) (the "CFR"). The CFR requires electrical lines to be specified heights above the navigational channel. To install the transmission cables under the bridge deck as contemplated in Barnhardt Option 1, the Company's conceptual design shows the cables installed approximately 3-4 feet below the lowest parts of the bridge. Accordingly, the resulting vertical clearance above the navigational channel in the Rappahannock could be in contravention of the CFR requirements. The Company intends to seek guidance from the Army Corps on this clearance issue and supplement the record as appropriate. In addition, the information gained from VDOT regarding this alternative may further inform this issue.

The JPA would also be reviewed and acted upon by the VMRC, and it is likely that a public hearing would be required. The Company expects approval of the JPA (assuming CFR compliance) could take between four to six months.

Due to impacts to tidal wetlands, the Company would also provide the JPA to the local wetlands board in Middlesex County for review and approval.

The Company does not expect that Barnhardt Option 1 will require the vacation of Baylor Grounds. However, the VMRC website showing the location of Baylor Grounds does not depict any vacated Baylor Grounds under the Norris Bridge. If vacation of the Baylor

Grounds under the bridge did not previously occur, then the Company could be required to vacate through the General Assembly.

Transition Station Permitting

Based on reviewing the Lancaster and Middlesex County regulations, it is my interpretation that a transition station in Lancaster County would require a Special Exception Permit (Article 5-1-23 of the Lancaster Zoning Ordinance) and a transition station in Middlesex County would qualify as a Permitted Use (Article 7-2-14 of the Middlesex Zoning Ordinance). Both Counties would require site plan approval as both transition stations would require more the 2,500 square feet of land disturbance.

VDOT Permitting and Coordination

The Company would apply to the VDOT to obtain a permit to attach the cable to Norris Bridge. Indeed, as seen in the Supplemental Direct Schedule 1 of Company Witness Wesley D. Keck, the Company has asked VDOT to provide a formal response regarding under what scenario(s) VDOT would approve the Barnhardt Option 1 configuration. The Company expects Barnhardt Option 1 would also require significant coordination with VDOT for the necessary road and lane closures on Route 3 during construction activities.

Q. What are the permitting requirements for Barnhardt Option 2?

A. As with Barnhardt Option 1, Dominion Virginia Power would be required to submit a JPA to the Army Corps, VMRC, and local wetlands board, and also seek necessary approvals associated with transition station permitting. In addition, the Army Corps could determine Barnhardt Option 2 does not qualify for a Nationwide Permit and require an Individual Permit instead. Finally, the Company would need to address additional

impacts to private and public oyster beds and obtain a Construction General Permit for the on-land trenching.

Individual Permit for Trenching

The Army Corps could provide a verification letter that the installation of a trenched cable qualifies for a Nationwide Permit. However, due to the significant amount of material disturbed for installation of the seven cables (described in detail in the Supplemental Alternatives Analysis sponsored by Company Witnesses Berkin and Benjamin W. Sussman, and Appendix F in particular), the Army Corps could decide that an Individual Permit is required. If the Army Corps were to require an Individual Permit, the Company would submit an Individual Permit application, which entails more detailed surveys and evaluations and takes significantly longer to approve. While there is not a specified duration for obtaining an Individual Permit, this process would likely take at least one year as the Army Corps must conduct a thorough review of the application.

Private and Public Oyster Bed Impacts

Due to the presence of private and public oyster beds in the area of the Rebuild Project, the Company would need to obtain private lease holder signatures, as well as have the public Baylor Grounds vacated. The 2015 Session of the Virginia General Assembly vacated the public Baylor Grounds for the Proposed 115 kV Overhead Route; however, that legislation only applies to the overhead construction contemplated by the proposed Rebuild Project or the 230 kV Overhead Alternative. The General Assembly would need to vacate the same public Baylor Grounds for the Underground Option (or clarify that underground construction is also permitted), plus significant additional area for Barnhardt Option 2 as quantified by the Supplemental Alternatives Analysis sponsored by Company

Witness Berkin.

Once the Company obtains the private lease holder signatures, and vacates the public Baylor Grounds, the VMRC would need to review the Rebuild Project JPA and, likely, hold a public hearing. The Company expects approval to take between four to six months. The same approvals noted above for the transition stations would also be required for Barnhardt Option 2.

DEQ Permit for Trenching

Finally, the trenching on land contemplated in Barnhardt Option 2 would require a Construction General Permit from the DEQ.

Q. Have you been able to determine the total additional estimated time for permitting required for Barnhardt Options 1 and 2?

A. Barnhardt Options 1 and 2 would both require new permit applications be filed. Depending on several variables, the permitting for either option could take a significant amount of time. Variables to consider – all outside of the Company's control – are Baylor Grounds requirements, VDOT, and Army Corps permitting.

In particular, Barnhardt Option 1 could require vacation of Baylor Grounds and Barnhardt Option 2 certainly does. Vacation of the Baylor Grounds must be done by the Virginia General Assembly, which only meets at the beginning of each year and would add significant time to the permitting process depending on when the Commission renders a decision.

Secondly, obtaining a permit to attach to the bridge (under Barnhardt Option 1) would

likely require lengthy coordination with VDOT to ensure that the cables in no way compromise the integrity of the bridge.

Lastly, the Army Corps Individual Permit likely needed for Barnhardt Option 2 is a significant unknown as to timing and additional requirements.

Q. What update can you provide regarding permitting for the Proposed 115 kV Overhead Route?

A. Prior to filing for approval at the Commission, the Company received verification from the Army Corps that the Rebuild Project meets the standards of the Nationwide Permit and the VMRC approved the Rebuild Project at its July 2015 hearing.

The Nationwide Permit expires March 18, 2017, unless the Company has either started work or is under a signed contract and able to complete work within one year of March 18, 2017. It is unlikely that the Company will be able to begin work prior to the March 17, 2017 date due to the March 1 evidentiary hearing. However, the Company will be under contract to begin the overhead work if the Commission rules favorably on the Proposed 115 kV Overhead Route and time-of-year restrictions do not conflict with the construction schedule. The Company is reasonably confident that it could complete the construction work before the March 17, 2018 deadline if work could commence in July of 2017.

The current VMRC permit for the Proposed 115 kV Overhead Route does not expire until July of 2018. If work on the Proposed 115 kV Overhead Route could commence in July of 2017, then the construction would be completed before the July 2018 expiration date.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

Berkin

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Jon M. Berkin

Title: Partner, Environmental Resources Management, Inc.

Summary:

Company Witness Jon M. Berkin introduces and sponsors all sections of the Supplemental Alternatives Analysis, except for Section 4.2.10 (Visual Assessment), which is sponsored by Company Witness Benjamin W. Sussman. Environmental Resource Management, Inc. ("ERM") was engaged on behalf of the Company to assist it in the identification and evaluation of route alternatives to resolve the identified electrical need that would meet the applicable criteria of Virginia law and the Company's operating needs. Additionally, Mr. Berkin co-sponsors the Supplemental Department of Environmental Quality ("DEQ") Report with Company Witness Amanda M. Mayhew.

SUPPLEMENTAL DIRECT TESTIMONY
OF
JON M. BERKIN
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Jon M. Berkin. I am employed as a Partner with Environmental Resources Management, Inc. ("ERM"). My business address is 1000 IDS Center, 80 South Eighth Street, Minneapolis, Minnesota 55402. ERM recently acquired my former company, Natural Resources Group, LLC ("NRG").

Q. Have you previously submitted testimony in this proceeding?

A. Yes. I submitted pre-filed direct testimony on behalf of Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company") to the State Corporation Commission of Virginia ("Commission") on February 29, 2016, in this proceeding in support of the Company's proposal to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9-mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project"). The Company's proposal included constructing 10 galvanized steel H-frame structures in the water approximately 100-feet east of the Norris Bridge ("Proposed 115 kV Overhead Route").

Q. What professional experience does ERM have with the routing of linear energy transportation facilities?

A. ERM has extensive experience in the routing and feasibility assessments of energy transportation projects. It has assisted its clients in the identification, evaluation and

selection of linear energy facilities for the past 21 years. During this time it has developed a consistent approach for linear facility routing and route selection based on the identification, mapping and comparative evaluation of routing constraints and opportunities within defined study areas. ERM uses data-intensive Geographic Information System spatial and dimensional analysis and the most current and refined data layers and aerial photography resources available in the identification, evaluation and selection of transmission line routes. In addition to Dominion Virginia Power, its clients include some of the largest energy companies in the United States, Canada and the world, including ExxonMobil, Excel Energy, Duke Energy, Spectra Energy, TransCanada, NVEnergy, Niagara Mohawk, Kinder Morgan, British Petroleum, Enbridge Energy and others. ERM also routinely assists the staff of the Federal Energy Regulatory Commission and the U.S. Forest Service in the identification and/or evaluation of linear energy routes to support federal National Environmental Policy Act evaluations. ERM works on both small and large energy projects and has assisted in or conducted the routing and route evaluation of some of the largest electric transmission line and pipeline facilities in North America.

Q. What is the purpose of your supplemental direct testimony?

A. The purpose of my supplemental direct testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016, which directed the Company to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii) installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow

depths adjacent to the banks ("Barnhardt Option 2").

ERM was engaged on behalf of the Company to assist it in the identification and evaluation of route alternatives to resolve the identified electrical need that would meet the applicable criteria of Virginia law and the Company's operating needs. For purposes of my supplemental direct testimony, I will introduce and sponsor all sections of the Supplemental Alternatives Analysis, except for Section 4.2.10 (Visual Assessment), which is sponsored by Company Witness Benjamin W. Sussman. I also co-sponsor the Supplemental Department of Environmental Quality Supplement with Company Witness Amanda Mayhew.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

Sussman

WITNESS SUPPLEMENTAL DIRECT TESTIMONY SUMMARY

Witness: Benjamin W. Sussman

Title: Consultant, Environmental Resources Management, Inc.

Summary:

Company Witness Benjamin W. Sussman sponsors Section 4.2.10 (Visual Assessment) of the Supplemental Alternatives Analysis, which is introduced by Company Witness Jon M. Berkin. Mr. Sussman's professional experience related to electric transmission line projects includes preparing and managing visual assessments for transmission, pipeline, wind, and other industrial projects.

SUPPLEMENTAL DIRECT TESTIMONY
OF
BENJAMIN W. SUSSMAN
ON BEHALF OF
VIRGINIA ELECTRIC AND POWER COMPANY
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUE-2016-00021

Q. Please state your name, position of employment, and business address.

A. My name is Benjamin W. Sussman. I am employed as a Consultant with Environmental Resources Management ("ERM"), which acquired Natural Resources Group, LLC ("NRG") in September 2014. My business address is 180 Admiral Cochrane Drive, Suite 400, Annapolis, Maryland 21409.

Q. Have you previously submitted testimony in this proceeding?

A. No, I have not.

Q. What is your educational and professional background?

A. I earned a Bachelor of Science degree in Science, Technology, and Society from Stanford University in 1998, and a Master's in City and Regional Planning from Georgia Tech in 2002. I have more than 17 years of experience in the fields of visual and socioeconomic impact assessment, local and regional land use planning, transportation planning, and urban design.

My professional experience related to electric transmission line projects includes preparing and managing visual assessments for transmission, pipeline, wind, and other industrial projects, including impact assessment documents such as National Environmental Policy Act ("NEPA")-compliant (and state-equivalent) Environmental Impact Statements ("EIS") and Environmental Assessments ("EA"). I have also prepared

comprehensive plans and community plans for small and large cities and unincorporated communities, with emphasis on the linkages between land use, growth management, and public infrastructure.

In addition to serving as a subject matter expert in the topics listed above, I also oversee large public comment management processes. I routinely manage extensive public engagement processes, including testimony before elected and appointed boards, as a part of impact assessment and planning projects, and have extensive experience at managing public meetings, stakeholder interviews, public communications and other forms of information gathering and dissemination.

Q. What professional experience does ERM have with assessing visual impacts of linear projects, such as electric transmission facilities?

A. As a full-service environmental consultancy, ERM routinely evaluates the visual impacts of linear projects, including electric transmission facilities, as well as aboveground and buried pipelines. ERM (including work performed by NRG prior to 2014) evaluates visual impacts for both applicants and federal, state, and local regulatory agencies, using applicable evaluation criteria, where applicable, and industry best practice where no specific criteria apply. Recent examples of visual impact assessment of linear facilities includes Virginia Electric and Power Company's ("Dominion Virginia Power" or the "Company") Skiffes Creek transmission line in southeastern Virginia, two separate natural gas pipeline projects in western Virginia and West Virginia, and the 850-mile proposed Alaska LNG pipeline. The pipelines in Virginia and West Virginia cross through national forests, and are thus subject to evaluation using the U.S. Forest Service's Scenery Management System, the most complex and stringent federal regulations

applicable to visual impacts. The Alaska LNG project would be evaluated under the Bureau of Land Management's Visual Resources Management system, another complex federal evaluation method.

Q. What is the purpose of your supplemental direct testimony?

A. On February 29, 2016, Dominion Virginia Power filed with the State Corporation Commission of Virginia ("Commission") for approval to rebuild approximately 2.2 miles of a portion of Line #65, inclusive of a 1.9-mile segment at the Norris Bridge (Route 3) crossing of the Rappahannock River (the "Rebuild Project"). The Company's proposal included constructing 10 galvanized steel H-frame structures in the water approximately 100-feet east of the Norris Bridge ("Proposed 115 kV Overhead Route").

The purpose of my supplemental direct testimony is to respond to the Hearing Examiner's Ruling of July 22, 2016, which directed the Company to conduct further study of cost, operational impact, and environmental impacts of: (i) installing a set of insulated transmission lines on the Norris Bridge ("Barnhardt Option 1"); and (ii) installing insulated transmission lines in a shallow trench across the river in conjunction with horizontally drilled pathways from the north and south banks traversing shallow depths adjacent to the banks ("Barnhardt Option 2").

Specifically, I sponsor Section 4.2.10 (Visual Assessment) of the Supplemental Alternatives Analysis, which is being introduced by Company Witness Jon M. Berkin.

Q. Does this conclude your supplemental direct testimony?

A. Yes, it does.

COMMONWEALTH OF VIRGINIA

BEFORE THE

STATE CORPORATION COMMISSION

APPLICATION OF

VIRGINIA ELECTRIC AND POWER COMPANY

FOR APPROVAL AND CERTIFICATION
OF ELECTRIC FACILITIES

Line #65 115 kV Rebuild at Norris Bridge

Application No. 276

Supplemental DEQ Supplement

Case No. PUE-2016-00021

Filed: October 31, 2016

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Based on consultations with the Department of Environmental Quality ("DEQ"), Virginia Electric and Power Company ("Dominion Virginia Power" or the "Company") has developed this Supplemental DEQ Supplement to facilitate review and analysis of the proposed Rebuild Project by DEQ and other relevant agencies.

1. Project Description

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, Dominion Virginia Power proposes to rebuild an approximately 2.2-mile segment of an existing single circuit 115 kV transmission line, Harmony Village-Northern Neck Line #65, including (1) approximately 0.3 mile on land entirely within the existing right-of-way on both sides of the Rappahannock River in Lancaster County (less than 0.1 mile) and Middlesex County (approximately 0.3 mile); and (2) a 1.9-mile section of Line #65 in the Rappahannock River utilizing an 80-foot right-of-way permitted by the Virginia Marine Resources Commission ("VMRC"), which expands to 200 feet at two sections in the center span of the Robert O. Norris Bridge ("Norris Bridge") to accommodate the fender system on either side of and parallel to the navigational channel in the river. Collectively, this 2.2-mile segment of Line #65 between White Stone Substation and Harmony Village Substation in Lancaster and Middlesex Counties, respectively, is the proposed rebuild project (the "Rebuild Project").

The Company initially considered two overhead alternatives that involve rebuilding a total of approximately 0.3 mile of Line #65 on land on both sides of the Rappahannock River in Lancaster and Middlesex Counties, and a rebuild and relocation of a 1.9-mile section of Line #65 in the Rappahannock River. These two overhead alternatives are referred to as the Proposed 115 kV Overhead Route and the 230 kV Overhead Alternative (collectively, the "Overhead Alternatives"). A 2.3-mile underground option along a similar route as the Overhead Alternatives was also initially considered (the "Underground Option"). These alternatives were included in the Department of Environmental Quality ("DEQ") Supplement originally submitted to the State Corporation Commission ("SCC") along with the Company's application for a certificate of public convenience and necessity on February 29, 2016 ("Application"). In response to a ruling entered by the Hearing Examiner on July 22, 2016, two additional options, Barnhardt Option 1 and Barnhardt Option 2, have also been analyzed and are discussed below in this Supplemental DEQ Supplement.

Proposed 115 kV Overhead Route (Proposed Route)

The Proposed 115 kV Overhead Route of the Rebuild Project is a 2.2-mile segment of an existing single circuit 115 kV transmission Line #65. The Proposed Route originates east of Mary Ball Road (State Route 3) in Middlesex County and heads northeast for approximately 0.3 mile, where it crosses the Rappahannock River for approximately 1.9 miles utilizing an 80-foot right-of-way permitted by the VMRC, which expands to 200 feet to at two sections in the center span of the Norris Bridge to accommodate the fender system on either side of the navigation channel in the river. The centerline of the proposed structures in the river will be located approximately 100 feet east of Norris Bridge. Once coming ashore on the northern bank of the Rappahannock River, the Proposed Route travels less than 0.1 mile in a northeasterly direction before ending at the first structure on land in Lancaster County.

230 kV Overhead Alternative

The 230 kV Overhead Alternative would rebuild a portion of the existing single circuit 115 kilovolt "(kV") transmission Line #65, along the same 2.2-mile Proposed 115 kV Overhead Route described above, except that the right-of-way would need to be expanded by three feet in Middlesex County to accommodate the operation of a 230 kV transmission line.

Underground Option

The Underground Option would replace approximately 2.3 miles of the existing single circuit 115 kV transmission Line #65 with underground and overhead construction. The Underground Option begins east of Mary Ball Road (State Route 3) at the transition station site in Middlesex County and heads northeast for approximately 0.3 mile, where it crosses the Rappahannock River for approximately 1.9 miles and would require a 100-foot right-of-way and two splice locations measuring 650- feet long and 200- feet wide. The centerline of the cables beneath the river will be located approximately 100 feet east of Norris Bridge. Once coming ashore on the northern bank of the Rappahannock River, the Underground Option travels 0.2 mile in a northeasterly direction before ending at the transition station site in Lancaster County.

Barnhardt Option 1

Barnhardt Option 1 involves replacement and relocation of a section of Line #65 that parallels Route 3 and crosses the Rappahannock River with new cables, entirely attached to the Norris Bridge; however, at approximately 2.3 miles, this option would be slightly longer than the Overhead Alternatives. This option would replace approximately 2.3 miles of Line #65 with primarily aboveground construction on Norris Bridge. The route generally follows along the centerline of the Proposed 115 kV Overhead Route until crossing Norris Bridge, utilizing approximately 0.45 mile of land in Lancaster and Middlesex Counties, and 1.86 miles over the Rappahannock River on Norris Bridge. This option would involve the placement of seven cables (two cables per phase with one spare) within approximately 1,100 feet of concrete-encased duct bank on the south shore and 1,200 feet of concrete-encased duct bank on the north shore. The remaining approximately 10,000 feet of cable will be installed within eight separate 8-inch-diameter fiberglass conduits attached to the underside of the bridge. In addition two, 4-inch-diameter fiberglass conduits will also be included to contain ground conductors and fiber optic cables. Where the conduits reach the ends of the bridge, they would curve to the east of the bridge and turn downward to enter the ground. At this point, the cables would transition from the conduit and into the concrete-encased duct bank described above. This option would require the same transition stations as the Underground Option.

Barnhardt Option 2

Barnhardt Option 2 involves replacement and relocation of a section of Line #65 that parallels Route 3 and crosses the Rappahannock River with new cables trenched into the

bottom of the Rappahannock River; however, at approximately 2.4 miles, this option would be the longest of all the alternatives. This option would replace approximately 2.4 miles of Line #65 with underground and overhead construction generally following along the centerline of the Proposed 115 kV Overhead Route on land, utilizing approximately 0.4 mile of land in Lancaster and Middlesex Counties, and approximately 2.0 miles under the Rappahannock River. This option would involve the placement of seven cables within 800 feet of concrete duct bank on each shore. At the end of the duct bank, the land cables would enter manholes where they would be spliced to submarine cables. These manholes would measure 10 feet in width, 28 feet in length, and 8 feet in depth. At the on-land splice locations, the seven submarine cables would enter into seven conduits. The conduits, installed via the horizontal direction drill ("HDD") construction method, would extend below the riverbed and would surface on the river bottom between 1,308 and 1,781 feet from shore on the south side and between 910 and 1,400 feet from the top of bank on the north side. The use of conduit in these locations would avoid direct disturbance to existing oyster leases. In the river, between the south- and north-side conduits, the submarine cables would be installed in seven trenches excavated into the river bottom using water jet plow technology. These seven trenches for the submarine cables would vary in length between 7,500 and 8,100 feet long. This option would require the same transition stations as the Underground Option.

2. Environmental Analysis

A. Air Quality

Construction of the Proposed 115 kV Overhead Route will not require that trees be cleared on the right-of way. Construction of the 230 kV Overhead Alternative, the Underground Option, or Barnhardt Options 1 or 2 would require the clearing of a small number of trees. Merchantable logs from those trees would be removed or stacked along the edge of the right-of-way and the remaining limbs and branches typically chipped and spread on the upland portions of the right-of-way. The Company does not expect to burn the cleared material. Equipment and vehicles that are powered by gasoline or diesel motors will be used during the construction of the line so there will be exhaust from those motors. During construction, if the weather is dry for an extended period of time, there will be airborne particles from the use of vehicles and equipment within the right-of-way. However, minimal earth disturbance will take place and vehicle speed, which is often a factor in airborne particulate, will be kept to a minimum. Erosion and sedimentation control is addressed in Section 2.G of this Supplemental DEQ Supplement.

B. Water Source

Natural Resources Group, LLC, an ERM Group company ("NRG") identified and mapped waterbodies in the Rebuild Project area using publicly-available geographic information system ("GIS") databases, U.S. Geological Survey ("USGS") topographic maps, recent (2011) digital aerial photography, and a wetland delineation conducted by Stantec Consulting Services, Inc. ("Stantec"). Waterbodies in the Rebuild Project area

are shown on Figure 3.2.1-1 of Appendix A in the original alternatives analysis prepared by NRG on behalf of the Company ("Alternatives Analysis") and filed with the Application. The only waterbody in the Rebuild Project area is the Rappahannock River.

According to the United States Army Corps of Engineers ("USACE") documentation, one waterbody considered navigable under Section 10 of the Rivers and Harbors Act is crossed by the Rebuild Project, the Rappahannock River. The waterbody is crossed by the alternatives and options under consideration.

Proposed Route

The Proposed 115 kV Overhead Route would cross the Rappahannock River, which is approximately 1.9 miles wide at the crossing. The Rappahannock River is identified as a Section 10 Navigable Water. Ten transmission structures will be placed in the Rappahannock River. The structures would be steel pole H-frames ranging in height from approximately 102 to 173 feet tall. The structures would be constructed from a barge and erected on concrete pilings capped with a concrete foundation. Installation of the concrete pilings to support the structures and fender system would result in 791 square feet (0.02 acre) direct impact on the river bottom. The foundations would measure 34 feet by 6.5 feet (221 square feet). Anticipated maximum dimensions for the concrete cap are 34-feet long by 6.5-feet wide by 5-feet thick. The top of the concrete cap will be installed approximately 21 feet 9 inches above the zero elevation water line. Additionally, a fender system will be constructed to protect the two structures on either side of the navigational channel. Each fender will be approximately 170 feet long and will consist of timber wales constructed on fiber piles. Construction of the Proposed Route would require encroachment over 2,765 square feet (0.06 acre)[1] of state-owned subaqueous bottomlands. These permanent impacts required the payment of royalties to the VMRC. Direct impact on the river bottom associated with the installation of the piles used to support the structure foundations and fender system is 791 square feet (0.02 acre) of permanent impact. Temporary impacts associated with the Proposed Route would include 0.02 acre of direct impact on the riverbed due to the placement of temporary piles required to construct the structure foundations and fender system.

The right-of-way for the Proposed Route would cross two private oyster leases. However, there would be no direct impacts to these oyster leases since no structures would be placed in the lease areas and the transmission line would span the lease locations. Indirect impacts on leased areas may include temporary increased

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[1] The calculations of both the area of encroachment of the Overhead Alternatives and direct impacts of the fender system were incorrect in the original Alternatives Analysis filed in February 2016. The calculations were not revised to reflect a last minute change in the dimension of the fenders. These dimensions have been revised here.

sedimentation and turbidity in the area immediately surrounding each structure during construction. Baylor Grounds are present in the Rappahannock River; however, Senate Bill 1030 adjusted the limits of the Baylor Grounds within the proposed right-of-way corridor for the Proposed Route. Therefore, no Baylor Grounds would be impacted by the Proposed Route.

Short-term, minor water quality impacts could occur during the construction of the Proposed Route. During construction in the uplands, such impacts would be associated with the soils from disturbed areas being transported by stormwater into adjacent waters during rain events. Increased turbidity and localized sedimentation of the stream bottom may occur as a result of the runoff. RPS Applied Science Associates ("ASA") studied the volume of sediment that may be re-suspended by construction activities within the river. The results of these studies are included in Appendix F of the Supplemental Alternatives Analysis. ASA evaluated the volume of sediment that may be re-suspended by pile driving to install the Proposed Route, and determined that approximately 8.0 cubic yards of fine-grained sediment would be re-suspended (10.7 cubic yards of total sediment re-suspended). Although installation of the Proposed Route would produce suspended sediment plumes along the bottom of the water column, it is unlikely that the sediment would impact drinking water supplies in the project area.

Impacts would be significantly reduced by the implementation of Dominion Virginia Power's erosion control measures, including the installation of erosion control structures and materials. The installation of the piles associated with the structure foundations and fender systems could result in short-term, minor water quality impacts during pile driving activities. Permanent impacts may include possible alteration of micro-currents in the project area, as well as increased hard substrate for aquatic habitat provided by the structures. The aerial portion of the overhead line is not expected to have any temporary or permanent impacts on the river.

230 kV Overhead Alternative

The 230 kV Overhead Alternative would cross the Rappahannock River along the same alignment as the Proposed Route and have the same configuration of structures. Ten transmission structures of slightly taller height will be placed in the Rappahannock River at the same locations as the Proposed Route and affect the same resources as described above in the discussion of the Proposed Route. The construction of the 230 kV Overhead Alternative would require the clearing of less than 0.01 acre of trees in Middlesex County to accommodate the 230 kV structures.

Underground Option

Similar to the two overhead routes, the Underground Option involves replacement and relocation of a section of Line #65 that parallels Route 3 and crosses the Rappahannock River; however at 2.3 miles long, this option would be slightly longer than the Overhead Alternatives. The Underground Option would be constructed with 230 kV insulation and

operate at 115 kV. The Underground Option would involve installing the electrical line below the river surface using the HDD construction method. The Underground Option would require a nominally wider construction right-of-way, but given installation by HDD, a majority of the construction will occur at a minimum of 60 feet below the riverbed. While no tower construction would occur within the river, two sites will be required in the river as splice locations. In addition, where the line reaches the surface, transition stations will be constructed to transition the line back to the existing overhead route. Construction of the Underground Option will in general require a 100-foot-wide right-of-way across the river and on land.

Because the drill length is limited to an effective length of about 7,000 feet due to cable length and pull limitations of the cables, two splice locations will be required within the river for the transmission line conduit. The HDDs for both 8-inch conduits will be conducted with three separate drills, one from each shoreline to the nearest splice location and an intermediate drill between two temporary splice locations within the river. The splice locations once constructed and placed in the river bottom will each measure 200 feet by 650 feet in size. The two splice locations within the river will each contain a work platform set on 30 steel piles driven into the river bottom. After splicing, the two conduits will be welded together and laid into trenches that have been dredged on the bottom of the river at the tie-in location. The tie-in trenches for each 8-inch pipe would be dredged from the two platforms and will be approximately 15- feet deep below the river bed, 30 feet wide and 650 feet long and require the dredging of approximately 24,566 cubic yards of river bottom substrate. The dredge material will be placed on barges and re-used for backfill material over the conduits. This excavation is expected to lead to up to 5.97 acres of temporary impact to the subaqueous bottom.

The cables will be installed under three private oyster lease areas in the Rappahannock River. The 100-foot-wide right-of-way across the river and the two 200-foot by 650-foot splice locations required for the Underground Option will require the vacation of additional Baylor Grounds. Approximately 5.19 acres of Baylor Grounds would need to be vacated to accommodate the additional right-of-way required for the Underground Option. In addition, the expanded right-of-way for the Underground Option would encroach upon 0.41 acre of a new, private oyster lease near the north bank of the river.

RPS ASA estimated that approximately 1,545 cubic yards of fine-grained sediment would be re-suspended by the two splicing excavations (approximately 2,677 cubic yards of total sediment re-suspended). The suspended sediment plume produced by the excavations would be distributed throughout the water column. The area of impact caused by settling particles is currently unknown; however, the suspended sediment plume is not expected to impact drinking water supplies in the project area. Impacts to the river substrate from the splice pit are expected to be temporary as the benthic environment recovers over time.

Short-term, minor water quality impacts could occur during the construction of this proposed option. During construction in the uplands, such impacts would be associated

with the soils from disturbed areas being transported by stormwater into adjacent waters during rain events. Increased turbidity and localized sedimentation of the stream bottom may occur as a result of the runoff. However, these impacts would be significantly reduced by the implementation of Dominion Virginia Power's erosion and sediment control measures, including the installation of erosion control structures and materials. The excavation of trenches associated with the splice areas could result in short-term, minor water quality impacts due to temporary increases in turbidity and suspended sediments.

The Underground Option will require an 80- to 100-foot-wide right-of-way on land and the construction of transition stations at either end of the route. The 100-foot-wide right-of-way would be reduced in some locations to avoid homes that are in close proximity to the Rebuild Project Area. Construction of the Underground Option would result in about 1.32 acres of tree clearing on land in Middlesex and Lancaster Counties where the right-of-way would be expanded and where the transition station would be built. During construction in the uplands, such impacts would be associated with the soils from disturbed areas being transported by stormwater into adjacent waters during rain events. Increased turbidity and localized sedimentation of the stream bottom may occur as a result of the runoff. However, these impacts would be significantly reduced by the implementation of Dominion Virginia Power's erosion control measures, including the installation of erosion control structures and materials.

Barnhardt Option 1

Barnhardt Option 1 would require a 1.86-mile crossing of the Rappahannock River (approximately MP 0.2 to 2.1). Construction of Barnhardt Option 1 would result in no direct impacts to waterbodies, including the Rappahannock River. The installation of the transmission line across the Rappahannock River would still require authorization from USACE under Section 10 of the Rivers and Harbors Act of 1899 and authorization from the VMRC for the crossing of state-owned subaqueous bottom.

Barnhardt Option 1 does not involve sediment disturbance and was not evaluated by RPS ASA.

Barnhardt Option 2

Barnhardt Option 2 would require a 2.0-mile crossing of the Rappahannock River (approximately MP 0.2 to 2.1). A total of seven separate cables would be installed across the river with each cable installation occurring in the following manner. The first 900 to 1,000 feet of both sides of the crossing will be installed using the HDD construction method, with the preferred method being to drill from the river to the shore. Approximately 900-1,000 feet from shore, a transition area approximately 25-feet-wide by 100-feet-long would be excavated to install conduit in the bore hole and transition each cable from HDD to jet-plow installation. After this transition period, the cables would be installed by a water jet plow. The water jet plow would excavate a trench

approximately 2-feet-wide and 10- to 15-feet-deep and lay the 230 kV cable simultaneously. The water jet plow would either bury the cable during the initial pass or bury the cable on a subsequent pass. The excavated transition areas would be backfilled with the excavated sediment upon cable installation. A total of 3.8 acres and 65,032 cubic yards of river bottom would be temporarily disturbed by cable installation. Since each cable would be spaced on 125-foot centers, the total easement width would be 780 feet.

Construction activities within the river area are expected to last approximately five months. Construction of the transmission line in the river would require state permits and would likely be subject to the standard Virginia Department of Game and Inland Fisheries ("VDGIF") time-of-year restriction between February 15 and June 30 for anadromous fish. Temporary noise and increased sedimentation and turbidity would be expected during these activities. Impacts to the river substrate from the excavation of the transition areas and jet plowing are expected to be temporary as the benthic environment recovers over time.

Barnhardt Option 2 would cross beneath three private oyster leases (approximately MPs 0.2 to 0.4 and 1.9 to 2.1). The expanded right-of-way for Barnhardt Option 2 would encroach upon an additional 1.84 acre of new private oyster lease. The HDD would go under these leases and no impact to the river substrate would be expected in these areas. Coordination with the lease holders would still be required to obtain easements across the leases. Increased sedimentation and turbidity from the excavation of the transition areas and jet plow may occur, but would be expected to have minimal effect on the oyster leases.

Senate Bill 1030 adjusted the limits of the Baylor Grounds within the proposed corridor for the 115 kV overhead crossing of the Rebuild Project. In general, the Barnhardt Option 2 requires a 700-foot wider easement than the Proposed 115 kV Overhead Route. Therefore, legislation would need to be passed by the General Assembly and signed by the Governor to vacate this area from the Public Baylor Grounds.

RPS ASA completed a preliminary sediment impact evaluation and estimated that approximately 6,253 cubic yards of fine-grained sediment would be re-suspended by the jetting method (approximately 15,595 cubic yards of total sediment re-suspended). This volume of total sediment is approximately 6 times the volume of sediment re-suspended by the Underground Option and approximately 1,457 times the volume of total sediment re-suspended by the Overhead Alternative. Although modeling information is not available, RPS ASA estimated that the sediment plume suspended by excavation to a barge would be primarily concentrated at the bottom of the water column, with a small volume of sediment introduced to the top of the water column. The area of impact caused by settling particles is not currently available. Due to the shallow depth of excavation along the river bottom, it is unlikely that the jetting method would impact drinking water supplies during the cable installation on the river bottom.

C. Discharge of Cooling Waters

No discharge of cooling waters is associated with the Rebuild Project.

D. Tidal and Non-tidal Wetlands

Within the location of the currently maintained right-of-way for Line #65, Stantec delineated wetlands using the Routine Determination Method as outlined in the 1987 Corps of Engineers Wetland Delineation Manual and methods described in the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). This delineation was confirmed by USACE by letter dated January 6, 2015. Copies of Stantec's report and the USACE confirmation letter are provided in Appendix E of the Alternatives Analysis filed with the Application.

An offsite desktop analysis was conducted for the additional right-of-way required for the 230 kV Overhead Alternative and the additional right-of-way required for the right-of-way and transition station locations for the Underground Option. Stantec reviewed existing data including aerial photography, topography, U.S. Fish and Wildlife Service National Wetlands Inventory ("NWI"), and National Resource Conservation Service ("NRCS") soil data to identify areas of potential wetlands. No wetlands are likely to occur within the transition station limits in Lancaster County. Wetlands are unlikely to occur within the transition station limits in Middlesex County.

One wetland complex was identified in the Rebuild Project area during the wetland delineation. This wetland can be characterized as a palustrine emergent and scrub-shrub and is located on the south side of the Rappahannock River and extends into the additional right-of-way that would be required for the 230 kV Overhead Alternative and Underground Option. Wetland vegetation is typified by wax myrtle (*Morella cerifera*), swamp rose-mallow (*Hibiscus mocheutos*), and the invasive species common reed (*Phragmites australis*). This wetland complex does not receive daily inundation from tides; however, it is located within 1.5 times the mean high water ("MHW") elevation of the Rappahannock River and would be classified as tidal wetlands for the purposes of VMRC and Middlesex County wetlands board jurisdiction. The wetlands are also under the jurisdiction of the USACE and the DEQ under Sections 404 and 401 of the Clean Water Act ("CWA"), respectively.

Proposed Route

Based on the confirmed wetland delineation, the Proposed Route would cross approximately 0.34 acre of wetland habitat within the maintained right-of-way for Line #65. No clearing would be required within this wetland. No transmission structures would be located within the wetland. This wetland would be spanned by the Proposed Route. If access within the wetland during construction is required to pull conductors, the wetland would be matted to support construction vehicles, equipment and materials. Wetland disturbance along the existing right-of-way should be minimal.

The rebuild activities occurring within the existing right-of-way would not require additional tree clearing within wetlands. Herbaceous vegetation would not be removed but could be temporarily affected by construction and vehicular movement. After construction, vegetation within the right-of-way would be allowed to revert to preconstruction conditions.

230 kV Overhead Alternative

The effects on wetlands as a result of construction of the 230 kV Overhead Alternative would be substantially the same as discussed above for the Proposed Route. The construction of the 230 kV Overhead Alternative would require three feet of additional right-of-way on land in Middlesex County. This additional right-of-way would encroach an additional 0.01 acre on the wetland complex in this location. However, since no structures would be placed in the wetland and the wetland would be spanned by the transmission line, there would be no impact to the wetland complex. If access within the wetland during construction is required to pull conductors, the wetland would be matted to support construction vehicles, equipment and materials. Wetland disturbance along the existing right-of-way should be minimal.

The rebuild activities occurring within the existing right-of-way would not require additional tree clearing within wetlands. Herbaceous vegetation would not be removed but could be temporarily affected by construction and vehicular movement. After construction, low vegetation within the right-of-way would be allowed to revert to preconstruction conditions.

Underground Option

Based on the wetland delineation, the right-of-way for the Underground Option would cross approximately 0.49 acre of palustrine emergent/scrub-shrub wetland habitat in Middlesex County (0.34 acre within the existing right-of-way and 0.15 acre within the new permanent right-of-way). The construction of the Underground Option will require the expansion of the right-of-way by between 35 and 55 feet on the land portion of the route in Middlesex County. This additional right-of-way would encroach further on the wetland complex in this location. However, since the transmission line would be installed using HDD, wetland impacts would be avoided. The cable would be located at a sufficient depth underground to avoid impacts to the wetland.

The Underground Option will not require additional tree clearing within wetlands. Herbaceous vegetation will not be removed; however it could be temporarily affected by construction during the removal of the existing transmission line structures. If access through the wetland is required during construction, mats will be utilized to support construction vehicles, equipment, and materials. After construction, vegetation within the right-of-way will be allowed to revert to preconstruction conditions. Wetland disturbance along the right-of-way should be minimal.

Barnhardt Option 1

Based on the confirmed wetland delineation, Barnhardt Option 1 would cross through approximately 260 feet of wetland habitat within existing, maintained right-of-way (approximately MP 2.1 to 2.2). The cables will be placed within concrete duct-bank installed via excavation of a 4.5-foot-wide by 5.5-foot-deep trench. Additional workspace to install the concrete duct-bank would be required within the proposed right-of-way. This would result in the temporary impact of 0.38 acre of wetland (0.26 acre within the existing right-of-way and 0.12 acre within the new permanent right-of-way). Permits from USACE and the Middlesex County wetlands board would be required to authorize these impacts. Due to the high water table within the wetland, dewatering of the trench would likely be required prior to placement of the concrete conduit. All water would be pumped through a filter bag to remove sediment prior to discharge of the water.

Barnhardt Option 1 would not require additional tree clearing within wetlands. Herbaceous vegetation would be removed during the excavation of the trench. During trench construction, timber mats would be utilized to support construction vehicles, equipment, and materials. Once the concrete encased ductbank has been installed, the trench would be backfilled with fluidized thermal backfill to within 12 inches of the original grade. The top 12 inches of the trench would be backfilled with native soil to restore the wetland to its original grade. After construction, the trench and other areas of disturbance would be seeded with native herbaceous vegetation and allowed to revert to preconstruction conditions.

No potential wetlands were identified within the transition station locations during the desktop wetlands review; therefore, wetland impacts at the transition stations are unlikely.

Barnhardt Option 2

Based on the confirmed wetland delineation, Barnhardt Option 2 would cross through approximately 340 feet of wetland habitat within existing, maintained right-of-way (approximately MP 2.1 to 2.2). The cables will be placed within concrete duct-bank installed via excavation of a 4.5-foot-wide by 5.5-foot-deep trench. Additional workspace to install the concrete duct-bank would be required within the proposed right-of-way. This would result in the temporary impact of up to 0.46 acre of wetland (0.34 acre within the existing right-of-way, 0.12 acre within the new permanent right-of-way, and less than 0.01 acre within temporary workspace). Less than 0.1 acre of beach would be temporarily impacted on the Middlesex County side due to the installation of concrete duct-bank required for the HDD tie-in to the transition station. Permits from USACE and the Middlesex County wetlands board would be required to authorize these impacts. Due to the high water table within the wetland, dewatering of the trench would likely be required prior to placement of the concrete conduit. All water would be pumped through a filter bag to remove sediment prior to discharge of the water.

Barnhardt Option 2 would not require additional tree clearing within wetlands. Herbaceous vegetation would be removed during the excavation of the trench. During trench construction, timber mats would be utilized to support construction vehicles, equipment, and materials. Once the concrete encased ductbank has been installed, the trench would be backfilled with fluidized thermal backfill to within 12 inches of the original grade. The top 12 inches of the trench would be backfilled with native soil to restore the wetland to its original grade. After construction, the trench and other areas of disturbance would be seeded with native herbaceous vegetation and allowed to revert to preconstruction conditions.

No potential wetlands were identified within the transition station locations during the desktop wetlands review; therefore, wetland impacts at the transition stations are unlikely.

E. Solid and Hazardous Waste

Environmental Database Review

Environmentally regulated sites in the study area have been identified using publically available databases obtained from the U.S. Environmental Protection Agency ("EPA") and the DEQ. The database provides "information about facilities, sites, or places subject to environmental regulation or of environmental interest." These include sites that use and/or store hazardous materials, waste producing facilities operating under permits from the EPA or other regulatory authorities, Superfund sites, the storage of petroleum, petroleum release sites and solid waste sites. The identification of a site in the databases does not necessarily mean that the site has contaminated soil or groundwater.

Based on a review of the EPA's Envirofacts and Cleanups in My Community databases, there are no Federal Superfund, Federal Brownfield, Resource Conservation and Recovery Act ("RCRA") Corrective Action sites, or Federal Emergency Response sites located within 2.0 miles of the Rebuild Project. According to the DEQ database, there are no permitted solid waste facilities or Virginia Pollutant Discharge Elimination System ("VPDES") sites located within 2.0 miles of the Rebuild Project area. The results of this review are depicted in Attachments 2.E.1 and 2.E.2.

Care will be taken to operate and maintain construction equipment to prevent any fuel or oil spills. Any waste created by the construction crews will be disposed of in a proper manner and recycled where appropriate and will be further detailed in the Company's stormwater pollution prevention plan, a component of the Virginia Stormwater Management Program, which will be submitted to the Virginia Department of Conservation and Recreation ("VDCR").

Petroleum Release Site Review

To further evaluate the potential impact to the Proposed Route, NRG assessed petroleum facilities and petroleum release sites recorded in the DEQ database that are located within

1,000 feet of the route centerline. One documented petroleum release is located approximately 480 feet south of the west end of the Rebuild Project area in Middlesex County. The release was reported in June 1989 at the Grey's Point Family Campground, and the case was closed in 1994. The DEQ deems a petroleum release closed once no further risk to the general public has been identified, although petroleum residue might remain. The risk assessment does not always consider the risk to subsurface utility work nor address additional costs associated with managing contaminated soil or groundwater. No additional information about the release is readily available in DEQ files. The depth to groundwater at the site is approximately 10 feet below ground surface, and the flow direction is estimated to be towards the southeast. As the petroleum release appears to be localized and is estimated to be hydraulically down-gradient of the project area, it is unlikely the release impacted soil and/or groundwater in the Rebuild Project area. NRG does not recommend further evaluation of the site. There are no identified petroleum releases within 1,000 feet of the east end of the Rebuild Project area in Lancaster County.

Contaminated Sediment Review: Rappahannock River

NRG completed a preliminary desktop evaluation to assess the presence of contaminated sediment in the Rappahannock River near the proposed Rebuild Project river crossing. In 1972, a sewage treatment plant released polychlorinated biphenyls ("PCB") into Mountain Run Lake, a tributary to the Rappahannock River located approximately 130 miles upstream of the Norris Bridge crossing. A review of the Magnitude and Extent of Contaminated Sediment and Toxicity in Chesapeake Bay (Hartwell and Hameedi, 2007) indicates that sediment samples collected from the top 2 to 3 centimeters in the Rappahannock River ranging from approximately 30 miles to 2 miles upstream of the proposed Rebuild Project river crossing contained detected concentrations of polycyclic aromatic hydrocarbons ("PAH"), PCBs, dichlorodiphenyl-trichloroethane ("DDT"), and metals. However, these contaminant concentrations were found to be below statistically derived levels where toxic effects would be rarely expected. These toxic effect levels were compiled by the National Oceanic and Atmospheric Administration ("NOAA") and are referred to as the effects range-low ("ER-L") concentrations. Similarly, NOAA's threshold effects level ("TEL") values from the Screening Quick Reference Tables ("SQuiRTs") also represent concentrations below which adverse effects are expected to rarely occur. In comparison, NOAA's effect range-median ("ER-M") values represent concentrations below which adverse biological effects may occasionally occur (Long et al. 1995).

In order to further evaluate sediment quality from the Rappahannock River in the vicinity of the Rebuild Project, NRG requested additional sediment data from the DEQ and the EPA's Environmental Monitoring and Assessment Program ("EMAP"). The sediment data provided by the DEQ for three sampling points (Points 1, 2 and 3) and the EMAP (Points 4, 5 and 6) are depicted on Attachment 2.E.2. The sample depths were not provided with the analytical data; thus, it was presumed that the data represented "grab" samples from the bottom of the Rappahannock River (i.e., the top of the sediment column). Table 2.E.1-1 below provides a summary of the available sediment data

received from the DEQ and EMAP. Based upon a review of available data, there were low-level exceedances of the TEL and/or ER-L values for certain metals (mercury, arsenic, chromium, nickel, and copper) and DDT. The contaminant concentrations were below the ER-M values at all six sampling locations.

Based on these data, heavy metal and organic contaminants may be encountered during project activities. However, the measured contaminant concentrations suggest that adverse biological effects may rarely or occasionally occur. Given the current understanding that the reviewed sediment data represent the top of the sediment column, the potential exists that the sediment quality deeper in the strata may be different. RPS ASA evaluated the Overhead Alternatives, Underground Option, and Barnhardt Option 2 (jet plow method) to calculate the volumes of sediment each method would disturb. Barnhardt Option 1 was not evaluated and is not depicted on Attachment 2.E.2, as the cables would be attached to the bridge and the installation would not disturb sediment. According to RPS ASA's findings, each method would produce a suspended sediment plume; however, Barnhardt Option 2 would disturb the greatest volume, resulting in approximately 6,253 cubic yards (or "cy") of re-suspended fine-grained sediment (15,595 cy total). This volume of re-suspended sediment is approximately 6 times the volume of fine-grained sediment that would be re-suspended by the Underground Option and approximately 1,457 times the volume of total sediment re-suspended by the Overhead Alternative. Although modeling information is not available, RPS ASA estimated that the sediment plume suspended by excavation to a barge would be primarily concentrated at the bottom of the water column, with a small volume of sediment introduced to the top of the water column. In summary, the Overhead Alternatives would disturb the least volume of contaminated sediment compared to the Barnhardt Option 2 and the Underground Option. Data indicating the area of impact and the rate of settling of the suspended sediment plumes produced by the Underground Option and Barnhardt Option 2 are currently unavailable.

TABLE 2.E.1-1
Rebuild Project
Summary of Available Sediment Data*

Chemicals	Sediment Sampling Locations						Standards		
	Point 1[1]	Point 2[2]	Point 3[3]	Point 4[5]	Point 5[6]	Point 6[5]	NOAA ER-M	NOAA ER-L	Marine TEL[7]
Inorganics (ppm)									
Silver	0.21	<0.02	0.046	0.12	0.43	0.139	3.7	1	0.730
Arsenic	2.5	5.4	0.68	**10.4**	**13.3**	**9.4**	70	8.2	7.24
Cadmium	0.08	0.225	0.14	0.438	0.306	0.523	9.6	1.2	0.68
Chromium	9.9	49.25	3.1	**75**	**74.5**	**69.6**	370	81	52.3
Copper	**20**	**27.7**	1.1	**26**	**20.2**	**21.8**	270	34	18.7
Mercury	**0.16**	0.104	0.0077	0.067	0.10	0.077	0.71	0.15	0.13
Nickel	4.5	**45.1**	0.77	**36.8**	**28.4**	**33.8**	51.6	20.9	15.9
Lead	14.1	**49.4**	2.1	26.1	22.5	23	218	46.7	30.24
Antimony	<0.5	<0.5	0.22	0.436	0.66	0.333	NA	NA	NA
Selenium	<0.5	<0.5	0.84	0.832	0.84	0.945	NA	NA	NA
Thallium	<0.3	<0.3	NA	0.572	NA	0.473	NA	NA	NA
Zinc	78	92.3	5.6	122	109	119	410	150	124
Organics (ppb)									
Total PCBs	4.08	0	0	6.6	0	5.71	180	22.7	21.6
PAH LMW	0	2.87[4]	16	76.16	25.7	86.7	3160	552	312
PAH HMW	177.6	8.33[4]	146	278.32	161.5	338.3	9600	1700	655
Aldrin	NA	NA	0	0	0	0.05	NA	NA	NA
Chlordane	0.29	NA	0	0.37	NA	0	6	0.5	2.26
DDT	**1.97**	NA	0	0	0	0	7	1	1.19
DDD	0.23	NA	0	0	0	0.16	20	2	1.22
DDE	0.5	NA	0	0	0	0.57	27	2.2	2.07
Mirex	0.02	NA	0	0	0	0	NA	NA	NA
Permethrin	0.11	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
BOLD values indicate exceedances of any listed standard.
DDD – Dichlorodiphenyldichloroethane
DDE – 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene
DDT – Dichlorodiphenyltrichloroethane
EMAP – Environmental Monitoring and Assessment Program
ER-M – Effects Range-Median
ER-L – Effects Range-Low
HMW – High molecular weight
LMW – Low molecular weight
NA – Not available
NOAA – National Oceanic and Atmospheric Administration
ppb -parts per billion
ppm – parts per million
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
TEL – Threshold Effects Level
VDEQ – Virginia Department of Environmental Quality

Sampling/Standard Information:
[1] August 1, 1995 Sampling Event (VDEQ)
[2] August 23, 2006 Sampling Event (VDEQ)
[3] August 15, 2005 Sampling Event (VDEQ)
[4] July 18, 2001 Sampling Event (VDEQ)
[5] August 28, 1997 Sampling Event (EMAP)
[6] August 10, 2006 Sampling Event (EMAP)
[7] Screening Quick Reference Table for Sediment (SQuiRTs)
*Sample depth was not provided; thus, it is assumed the samples were grab samples taken from the uppermost sediment interval.

F. Natural Heritage, Threatened and Endangered Species

In order to identify areas of ecological significance within the Rebuild Project area, Stantec conducted subwatershed queries of the VDCR Natural Heritage Resources ("NHR") website, the VDGIF Virginia Fish and Wildlife Information Service ("VaFWIS") website, and the U.S. Fish and Wildlife Information for Planning and

Conservation ("IPAC") website. Additionally the VDCR provided comments in a May 18, 2015 letter and in a subsequent letter dated February 3, 2016 on the proposed overhead crossing during the VMRC permitting process. The College of William and Mary Center for Conservation Biology ("CCB") Eagle Nest Locator was used to determine the presence of bald eagle nests and roosts within the Rebuild Project vicinity. Stantec also used the U.S. Fish and Wildlife Service ("FWS") Virginia Field Office's Bald Eagle Map tool to review whether any eagle concentration areas occurred along the Rappahannock River within the Rebuild Project vicinity.

The data review identified several federally-listed species protected under the Federal Endangered Species Act ("ESA") and the Virginia ESA, including the Atlantic sturgeon (*Acipenser oxyrinchus*), sensitive joint-vetch (*Aeschynomene virginica*), and the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*). The northern long-eared bat (*Myotis septentrionalis*) is protected under the Federal ESA but is not state listed. The Atlantic sturgeon has been historically documented in the Rappahannock River, including in the vicinity of the proposed crossing. The sensitive joint-vetch has been documented in Middlesex County. Swamp pink has been documented in Charles City County. The northeastern beach tiger beetle observations were documented within Lancaster County at Cherry Point, approximately 0.7 mile from the proposed crossing. The FWS has identified habitat for the northern long-eared bat in Lancaster and Middlesex Counties.

The data review also identified the peregrine falcon (*Falco peregrinus*), a state-only listed species protected under the Virginia ESA. A pair of peregrine falcons nests on the Norris Bridge, between Lancaster and Middlesex Counties.

Species-specific surveys may be recommended prior to construction to determine whether a listed species exists within the Rebuild Project area. If identified, the Company will coordinate with the appropriate regulatory agencies to minimize any impacts on listed species and/or listed habitat(s).

The closest bald eagle nest is approximately 0.3 mile southeast of the southern terminus of the proposed Rebuild Project. A second bald eagle nest is located 0.7 mile east of the northern terminus of the Rebuild Project. The Rebuild Project does not intersect the primary or secondary management zones for these nests. No bald eagle roosts occur within five miles of the Rebuild Project area. No eagle concentration areas occur within this portion of the Rappahannock River. If an eagle nest is identified within 660 feet of the Rebuild Project right-of-way prior to construction, the Company will work with the appropriate jurisdictional agencies to minimize impacts on this species.

Construction and maintenance of the new transmission line facilities could have some minor effects on wildlife; however, impacts on most species will be short-term in nature, and limited to the period of construction.

Correspondence from the VDCR dated May 18, 2015 and February 3, 2016 and correspondence with USACE dated July 14, 2015 are provided as Attachment 2.F.1.

Proposed Route

Several federally-listed species were noted in the database searches for the Proposed Route. The FWS IPAC report identifies the federally-listed northern long-eared bat (*Myotis septentrionalis*) and northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*). The northern long-eared bat utilizes forest habitat. Since no clearing will be required for the Proposed Route, no adverse effects would be expected. Northeastern beach tiger beetles utilize wide beach habitat. The aerial crossing will span the Rappahannock River beach areas; therefore, no adverse effects would be expected.

The VDCR NHR subwatershed list identifies the federally-listed sensitive joint-vetch (*Aeschynomene virginica*) as occurring within the subwatershed of the Proposed Route. No appropriate tidal wetland habitat appears to occur within the Rebuild Project area. Additionally, VDCR did not identify the sensitive joint-vetch as a species of concern for the Rebuild Project in their May 18, 2015 letter and their subsequent February 3, 2016 letter. Therefore, no adverse effects would be expected to this species.

The VDGIF VaFWIS data identifies historical records of the federally-listed Atlantic sturgeon (*Acipenser oxyrhincus*) within the vicinity of the Rappahannock River crossing. The Company would adhere to a time-of-year restriction for anadromous fish that would prohibit pile driving activities between February 15 and June 30. Additionally, the Company will utilize bubble curtains during pile driving activities in water depths less than 25 feet. With these measures, no adverse effects would be expected to this species (see Attachment 2.F.1).

The VDGIF VaFWIS database search identified the state-listed peregrine falcon (*Falco peregrinus*) within the project area. The VDCR letter indicated that there is a peregrine falcon nest on the Norris Bridge, which is associated with the Norris Bridge Conservation Site. The Company would adhere to the DGIF time-of-year restriction of no work between February 15 and July 15 within 600 feet of the nest. Therefore, no adverse effects would be expected to this species. The closest bald eagle nest is approximately 0.3 mile southeast of the southern terminus of the Proposed Route. A second bald eagle nest is located 0.7 mile east of the northern terminus of the Proposed Route. The proposed route does not intersect the primary or secondary management zones for these nests.

230 kV Overhead Alternative

The same federally- and state-listed species identified for the Proposed Route could be present within the Rebuild Project area for the 230 kV Overhead Alternative. Minimal tree clearing may be required for the 230 kV Overhead Alternative in Middlesex County where the right-of-way for the route would need to be expanded. Coordination with the FWS would occur as needed to ensure that the northern long-eared bat would not be adversely affected by the project.

Underground Option

The same federally- and state-listed species identified for the Overhead Alternatives could be present within the Rebuild Project area for the Underground Option. Since the northern long-eared bat utilizes forested habitat, northern long-eared bat habitat may occur within the transition station location in Middlesex County, which is located in a forested area, and along the additional right-of-way required for the Underground Option that would require tree clearing. Additional coordination with FWS may need to occur to determine whether the northern long-eared bat may be adversely affected by the Underground Option. As with the Overhead Alternatives, no beaches will be impacted during construction, so no adverse effects to the northeastern beach tiger beetle would be expected.

No appropriate habitat appears to occur for the sensitive joint-vetch and the VDCR letter dated May 18, 2015 and their subsequent February 3, 2016 letter did not identify this species as a concern for the Rebuild Project. Therefore, the Underground Option is not expected to adversely affect the sensitive joint-vetch.

The installation of piles associated with the temporary work platforms at the splice locations may affect anadromous fish. The excavation of trenches associated with the splice locations may lead to temporary, localized turbidity that may affect the Atlantic sturgeon. Adherence to the time-of-year restriction for anadromous fish of no pile driving or dredging activities between February 15 and June 30 should ensure that no adverse effects will occur to this species from construction. With these measures, construction would not be expected to adversely affect this species. The National Marine Fisheries Service ("NMFS") has proposed critical habitat for the Atlantic sturgeon within the Rappahannock River. During the review of the Section 10 permit for the crossing, USACE would be required to coordinate with NMFS to determine whether the Underground Option would adversely modify any critical habitat designated by NMFS. The Underground Option would require excavation of the splice pits within river substrate proposed for critical habitat designation. Although the splice pit areas are insignificant portions of the Rappahannock River substrate and impacts would be temporary, it is unclear what criteria NMFS will use to determine whether critical habitat is adversely modified.

The proposed transmission line would emit magnetic and electric fields. The electric field is contained within the cable insulation; therefore, fisheries would not be affected by electrical fields. The magnetic field at the splice locations is expected to be up to 0.33 mG at the river bottom above the cables and would decrease from this point with increasing distance. The NOAA NMFS concurred with a Biological Assessment that magnetic fields from an underwater high voltage directional current ("HVDC") transmission line calculated to be 162 mG at the river bottom-water interface would have

an insignificant effect to the Atlantic sturgeon.[2] Since the magnetic field expected for the underground options is less than the 162 mG reviewed by NMFS, magnetic field effects to anadromous and other fish species would likely also be insignificant.

The peregrine falcon nest on the Norris Bridge is located greater than 2,000 feet from either splice location. Therefore, work at these locations would not be expected to adversely affect nesting falcons. The closest bald eagle nest is located approximately 1,500 feet from the Middlesex County transition station. Both transition stations are located outside of the primary and secondary management zones for bald eagle nests.

Barnhardt Option 1

The same federally- and state-listed species identified for the Proposed Route could be present within the Rebuild Project area for Barnhardt Option 1. Since the northern long-eared bat utilizes forested habitat, northern long-eared bat habitat may occur within the transition station location in Middlesex County, which is located in a forested area, and along the additional right-of-way required for Barnhardt Option 1 that would require tree clearing. Additional coordination with FWS may need to occur to determine whether the northern long-eared bat may be adversely affected by Barnhardt Option 1. As with the Overhead Alternatives, no beaches will be impacted during construction, so no adverse effects to the northeastern beach tiger beetle would be expected.

No appropriate habitat appears to occur for the sensitive joint-vetch and the VDCR letter dated May 18, 2015 and their subsequent February 3, 2016 letter did not identify this species as a concern for the Rebuild Project. Therefore, Barnhardt Option 1 is not expected to adversely affect the sensitive joint-vetch.

No work is proposed within the Rappahannock River; therefore, no effect to the Atlantic sturgeon or proposed critical habitat would be expected from construction. As noted above, the proposed transmission line would emit magnetic and electric fields. The electric field is contained within the cable insulation; therefore, fisheries would not be affected by electrical fields. Since the cables would be attached to the bridge and magnetic field strength decreases with distance, it is expected that the magnetic field within the Rappahannock River would be insignificant for most of the crossing; therefore, fisheries would not be affected by electrical fields for Barnhardt Option 1.

The Company's evaluation of an option of attaching the conduit to the bridge for the transmission line underwent an engineering evaluation to determine the optimum location for the conduit on Norris Bridge to maximize stability, extend its operating life, and to

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[2] NMFS. 2014. Letter from John K. Bullard to Brian Mills, U.S. Department of Energy. "Champlain Hudson Power Express project – Endangered Species Act Section 7 Consultation". September 18, 2014.

facilitate maintenance of the line. Based on that engineering evaluation, the Company identified suspending the conduits below the large transverse I-beams centered longitudinally with the bridge as the best location for the conduit to be placed. This location is based on current bridge structural components, weight of the new cable conduit, and operation of the transmission line. Although the nest could remain with this option, this location would place the conduit bank directly below the nest. The conduit bank should not restrict access to the nest; however, it is unknown as to whether or not the adult pair of falcons using this nest would continue to consider the site suitable for nesting with the addition of the conduit bank.

The VDGIF has identified a time-of-year-restriction for activities within a 600-foot buffer of peregrine falcon nests in order to protect the birds during the critical nesting season. The restricted period when no activity is allowed within that buffer is between February 15 and July 15, noting that once birds are removed from a nest (for instance as part of the hacking program), the restriction may be lifted for that nest after consultation with VDGIF, even if before July 15.

The engineering evaluation estimated 14 months to install the conduit and pull, splice, and terminate the cable. With the addition of the up to five months of restrictions within 600 feet of the nest, this would likely extend the schedule by at least two to three months. Additionally, scheduling lane closures to facilitate conduit installation and account for the timing restriction around the nest could further complicate construction progress and cost.

The closest bald eagle nest is located approximately 1,500 feet from the Middlesex transition station. Both transition stations are located outside of the primary and secondary management zones for bald eagle nests.

Barnhardt Option 2

The same federally- and state-listed species identified for the Proposed Route could be present within the Rebuild Project area for Barnhardt Option 2. Since the northern long-eared bat utilizes forested habitat, northern long-eared bat habitat may occur within the transition station location in Middlesex County, which is located in a forested area, and along the additional right-of-way required for Barnhardt Option 2 that would require tree clearing. Additional coordination with FWS may need to occur to determine whether the northern long-eared bat may be adversely affected by Barnhardt Option 2. As with the Overhead Alternatives, no beaches will be impacted during construction, so no adverse effects to the northeastern beach tiger beetle would be expected.

No appropriate habitat appears to occur for the sensitive joint-vetch and the VDCR letter dated May 18, 2015 and their subsequent February 3, 2016 letter did not identify this species as a concern for the Rebuild Project. Therefore, Barnhardt Option 2 is not expected to adversely affect the sensitive joint-vetch.

The VDGIF VaFWIS data identifies historical records of the federally-listed Atlantic sturgeon (*Acipenser oxyrhincus*) within the vicinity of the Rappahannock River crossing.

USACE would be required to coordinate with NMFS during the Section 10 permit review to determine whether the option may adversely affect the Atlantic sturgeon. This option would require HDD of seven cables under the oyster lease areas, at which point 25-foot-wide by 100-foot-long threading pits would be mechanically excavated for each cable. A jet plow would then be used to trench each cable 10 to 15 feet into the river bottom. NMFS would likely require a February 15 to June 30 time-of-year restriction for anadromous fish for construction activities within the river. These measures should minimize adverse effects to Atlantic sturgeon. NMFS has proposed critical habitat for the Atlantic sturgeon within the Rappahannock River. Barnhardt Option 2 would result in the temporary disturbance of 3.30 acres of river substrate. Although the excavated and jet plowed areas are insignificant portions of the Rappahannock River substrate and impacts would be temporary, it is unclear what measure NMFS will use to determine whether critical habitat is adversely modified.

As noted above, the proposed transmission line would emit magnetic and electric fields. The electric field is contained within the cable insulation; therefore, Atlantic sturgeon would not be affected by emitted electrical fields. The seven 230 kV AC cables would be operated at 115 kV and spaced on 125-foot centers. Magnetic fields from multiple AC submarine cables can interact with each other, making the magnetic fields more difficult to model. Cables for Barnhardt Option 2 would be buried 10-15 feet below the river substrate. This depth is similar to the depth below substrate associated with the Underground Option; however, the magnetic fields from the cables associated with Barnhardt Option 2 have not been modeled at this time. If this option were to be selected, the magnetic fields associated with the submarine cables would need to be modeled so that NMFS could evaluate whether the Atlantic sturgeon would be adversely affected or critical habitat would be modified by the project.

The VDGIF VaFWIS database search identified the state-listed peregrine falcon (*Falco peregrinus*) within the Rebuild Project area. The potential impacts on peregrine falcon are discussed in section 4.2.6 above. A peregrine falcon nest occurs on the Norris Bridge. The splice pits are outside of the 600-foot buffer DGIF implements for a time-of-year restriction. Therefore, no effect would be anticipated to the peregrine falcon.

In considering the placement of the 115 kV transmission line in a conduit attached to the Norris Bridge, the company conferred with the Virginia Department of Transportation ("VDOT") to determine the specific location of the peregrine falcon nest on the VDOT-operated and maintained bridge. The nest was identified on a nest platform in the latitudinal middle of the bridge (i.e., directly under the center stripe of the roadway), approximately 5,000 feet from the eastern shoreline of the Rappahannock River.

G. Erosion and Sediment Control

Dominion Virginia Power is required to submit annual erosion and sediment control specifications and an anticipated list of transmission line projects to DEQ for review and approval. Dominion Virginia Power's annual submittal will follow DEQ guidelines, and

the Project will be included in the submittal. These specifications are given to the Dominion Virginia Power's contractors and require erosion and sediment control measures to be in place before construction of the line begins and specify the requirements for rehabilitation of the right-of-way.

H. Archaeological, Historic, Scenic, Cultural or Architectural Resources

Proposed Route

No archaeological sites are documented in the right-of-way for the Proposed Route.

There are three considered resources relevant to the Proposed Route. They include two National Register of Historic Places ("NRHP")-listed resources within 1.0 mile of the proposed routes, Pop Castle (DHR #051-0075) and Grey's Point Plantation (DHR #059-0025), and the Captain John Smith Chesapeake National Historic Trail, a national historic trail designated by the U.S. Congress. Based on line of sight analysis, there will be no impact to Grey's Point Plantation by the Proposed Route. There will be minimal impacts to both Pop Castle and the Captain John Smith Chesapeake National Historic Trail from the Proposed Route.

230 kV Overhead Alternative

No archaeological sites are documented in the right-of-way for the 230 kV Overhead Alternative.

There are three considered resources relevant to the 230 kV Overhead Alternative. They include two NRHP-listed resources within 1.0 mile of the 230 kV Overhead Alternative route, Pop Castle (DHR #051-0075) and Grey's Point Plantation (DHR #059-0025), and the Captain John Smith Chesapeake National Historic Trail, a national historic trail designated by the U.S. Congress. Based on line of sight analysis, there will be no impact to Grey's Point Plantation by the 230 kV Alternative Route. There will be minimal impacts to both Pop Castle and the Captain John Smith Chesapeake National Historic Trail from the 230 kV Overhead Alternative.

Underground Option

No archaeological sites are documented in the right-of-way for the Underground Option.

There are three considered resources relevant to the Underground Option. They include two NRHP-listed resources within 1.0 mile of the Underground Option route, Pop Castle (DHR #051-0075) and Grey's Point Plantation (DHR #059-0025), and the Captain John Smith Chesapeake National Historic Trail, a national historic trail designated by the U.S. Congress. Based on line of sight analysis, there will be no impacts to Pop Castle and minimal impacts to Grey's Point Plantation, based on views of transition station structures. The Underground Option will have minimal visual impacts on the Captain John Smith Chesapeake National Historic Trail, based on views of the transition station

structures in Middlesex County, and minimal direct impacts from installation of underground cabling.

Barnhardt Option 1

No archaeological sites are documented in the right-of-way for Barnhardt Option 1.

There are three considered resources relevant to Barnhardt Option 1. They include two NRHP-listed resources within 1.0 mile of the Barnhardt Option 1 route, Pop Castle (DHR #051-0075) and Grey's Point Plantation (DHR #059-0025), and the Captain John Smith Chesapeake National Historic Trail, a national historic trail designated by the U.S. Congress. Based on line of sight analysis, there will be no impacts to Pop Castle and minimal impacts to Grey's Point Plantation, based on views of transition station structure associated with the transition structure in Middlesex County. Barnhardt Option 1 will have minimal visual impacts to the Captain John Smith Chesapeake National Historic Trail, based on views of the transition station structures in Middlesex County and views of the conduits affixed to the underside of the Norris Bridge.

Barnhardt Option 2

No archaeological sites are documented in the right-of-way for Barnhardt Option 2.

There are three considered resources relevant to Barnhardt Option 2. They include two NRHP-listed resources within 1.0 mile of the Barnhardt Option 2 route, Pop Castle (DHR #051-0075) and Grey's Point Plantation (DHR #059-0025), and the Captain John Smith Chesapeake National Historic Trail, a national historic trail designated by the U.S. Congress. Based on line of sight analysis, there will be no impacts to Pop Castle and minimal visual impacts to Grey's Point Plantation, based on views of transition station structures in Middlesex County. Barnhardt Option 2 will have minimal visual impacts to the Captain John Smith Chesapeake National Historic Trail, based on views of the transition station structures in Middlesex County. The proposed installation of the underground cabling in the riverbed associated with Barnhardt Option 2 would have a minimal direct effect on the Captain John Smith Chesapeake National Historic Trail.

Correspondence from the Virginia Department of Historic Resources ("DHR") dated February 10, 2016 is provided as Attachment 2.H.1.

I. Chesapeake Bay Preservation Areas

Construction, installation, operation and maintenance of electric transmission lines are conditionally exempt from the Chesapeake Bay Act as stated in the exemption for public utilities, railroads, public roads and facilities in 9 Virginia Code 25-830-150. The Company will meet those conditions Wildlife Resources

As noted in Section 2.F, the FWS, VDCR and VDGIF databases were searched in order to assess the potential presence of any federal- or state-listed threatened or endangered

species in the vicinity of the Rebuild Project. The search determined there is the potential presence of four federal- and state-listed endangered and threatened species within the Rebuild Project area.

Proposed Route

In addition to the four listed species, the waters of the Rappahannock River are known anadromous fish waters and Essential Fish Habitat ("EFH"). It is expected that adherence to designated time-of-year restrictions and utilization of bubble curtains would minimize impacts on EFH and any listed fish species during construction. Due to the open design of the structure foundations (two to three concrete pile footings), the structures are not expected to serve as an impediment to fish movement. Other than the previously mentioned temporary impacts, the Proposed Route is not expected to have any permanent impacts on EFH or fisheries managed in the area.

Since all upland work will be conducted within currently maintained right-of-way for Line #65, minimal impact to wildlife habitat would be expected.

230 kV Overhead Alternative

The 230 kV Overhead Alternative will affect the same species and EFH as described above in the discussion of the Proposed Route. Minimal tree clearing (less than 0.01 acre) would be required where the right-of-way for the 230 kV Overhead Alternative would need to be expanded in Middlesex County. This should result in minimal, if any, impact to wildlife habitat.

Underground Option

The Underground Option would affect the same species and EFH as described for the Proposed Route and 230 kV Overhead Alternative. It is expected that adherence to designated time-of-year restrictions would minimize impacts on EFH and any listed fish species during construction. Since the cables would be installed below the bottom of the river, there would be no permanent impediment to fish movement. Other than the previously mentioned temporary impacts, the Underground Option is not expected to have any permanent impacts on EFH or fisheries managed in the area.

Clearing of 1.32 acre of forest within the additional right-of-way required for the Underground Option and for the transition station in Middlesex County would have localized impact to wildlife habitat. Clearing activities could result in mortality of sedentary or slow moving forest wildlife species. Mobile species would be able to avoid the construction activities and relocate to available forest habitat in the immediate vicinity.

Barnhardt Option 1

Barnhardt Option 1 would affect the same species and EFH as described for the Proposed Route and 230 kV Overhead Alternative. It is expected that adherence to designated time-of-year restrictions would minimize impacts on EFH and any listed fish species during construction. Since the cables would be installed on Norris Bridge, there would be no permanent impediment to fish movement. Other than the previously mentioned temporary impacts, Barnhardt Option 1 is not expected to have any permanent impacts on EFH or fisheries managed in the area.

Clearing of 0.97 acre of forest within the additional right-of-way required for the Barnhardt Option 1 and for the transition station in Middlesex County would have localized impact to wildlife habitat. Clearing activities could result in mortality of sedentary or slow moving forest wildlife species. Mobile species would be able to avoid the construction activities and relocate to available forest habitat in the immediate vicinity.

Barnhardt Option 2

Barnhardt Option 2 would affect the same species and EFH as described for the Proposed Route and 230 kV Overhead Alternative. It is expected that adherence to designated time-of-year restrictions would minimize impacts on EFH and any listed fish species during construction. Since the cables would be installed on Norris Bridge, there would be no permanent impediment to fish movement. Other than the previously mentioned temporary impacts, Barnhardt Option 2 is not expected to have any permanent impacts on EFH or fisheries managed in the area.

Clearing of 0.98 acre of forest within the additional right-of-way required for the Barnhardt Option 2 and for the transition station in Middlesex County would have localized impact to wildlife habitat. Clearing activities could result in mortality of sedentary or slow moving forest wildlife species. Mobile species would be able to avoid the construction activities and relocate to available forest habitat in the immediate vicinity.

J.Recreation, Agricultural, and Forest Resources

Proposed Route

Land cover affected along the Proposed Route consists of 1.82 miles of open water (84 percent), 0.17 mile of developed, open space (8 percent), 0.10 mile of developed, low/medium intensity land (5 percent), 0.07 mile of forested land (3 percent), and 0.01 mile of marshland (>1 percent).

The Proposed Route crosses the Rappahannock River between MPs 0.0 and 1.9. For the Rappahannock River crossing, the Proposed Route requires 19.81 acres of new

permanent right-of-way to accommodate the 80 foot-wide right of way and fender locations. This right-of-way was granted through the vacation of Baylor Grounds.

Along the Rappahannock River are the Captain John Smith Chesapeake National Historic Trail and the Lancaster County Rappahannock River Through Trail. Construction of the Proposed Route would not impede use of the water trails because boaters can be diverted from construction areas. The Proposed Route is within 0.25 mile of Grey's Point Camp (MP 2.1), Grey's Point Beach and Water Access (MP 2.1), Willaby's Café (MP 0.0) and Rivers Landing Bed and Breakfast (MP 0.0). No permanent or construction impacts are anticipated on these recreation areas.

Because the Proposed Route follows an existing right-of-way on land, no impacts to agricultural or forest resources are anticipated.

230 kV Overhead Alternative

Since the 230 kV Overhead Alternative follows the same alignment as the Proposed Route, it would have the substantially the same impacts on land cover and recreational resources as the Proposed Route. The only difference would be that the 230 kV Overhead Alternative would require the clearing of less than 0.01 acre of forested land where the right-of-way for the 230 kV Overhead Alternative would need to be expanded in Middlesex County.

Underground Option

Land cover affected along the Underground Option right-of-way would consist of 1.82 miles of open water (78 percent), 0.30 mile of developed, open space (13 percent), 0.10 mile of developed, low/medium intensity land (4 percent), 0.10 mile of forested land (4 percent), 0.01 mile of agricultural land (1 percent), and 0.01 mile of marshland (>1 percent).

The Underground Option crosses the Rappahannock River between MPs 0.2 and 2.1. The Underground Option would require 26.50 acres of new permanent right-of-way along the river bottom to accommodate its 100-wide right-of-way and 200-feet-wide by 650-feet-long splice locations.

The Underground Option would cross both the Captain John Smith Chesapeake National Historic Trail and the Lancaster County Rappahannock River Through Trail. Use of the water trails would not be affected during construction of the Underground Option because boaters can be diverted from construction areas. The Underground Option is within 0.25 mile of Grey's Point Camp (MP 2.3), Grey's Point Beach and Water Access (MP 2.2), Willaby's Café (MP 0.0) and Rivers Landing Bed and Breakfast (MP 0.0). No permanent or construction impacts are anticipated on these recreation areas.

The additional right-of-way required for the Underground Option would require the clearing of 1.32 acres of forest land and impact 1.98 acres of agricultural land.

Barnhardt Option 1

Land cover affected along the Barnhardt Option 1 right-of-way consist of approximately 2.0 miles of developed open space (87 percent), approximately 0.14 mile of developed, low/medium intensity land (6 percent), approximately 0.08 mile of forested land (3 percent), approximately 0.07 mile of open water (3 percent), and approximately 0.02 mile of agricultural land (1 percent).

Barnhardt Option 1 crosses the Rappahannock River between MPs 0.2 and 2.1. Barnhardt Option 1 would cross the river entirely on Norris Bridge and would not require any new permanent right-of-way along the river bottom.

Barnhardt Option 1 would cross both the Captain John Smith Chesapeake National Historic Trail and the Lancaster County Rappahannock River Through Trail. Given that this option primarily involves work on the bridge there would be minimal impacts to recreators. However, this option would also involve the removal of all existing structures located within the Rappahannock River. Use of the water trails will not be affected during construction of Barnhardt Option 1 because boaters can be diverted from construction areas during tower removal. Barnhardt Option 1 is within 0.25 mile of Grey's Point Camp (MP 2.3), Grey's Point Beach and Water Access (MP 2.2), Willaby's Café (MP 0.1) and Rivers Landing Bed and Breakfast (MP 0.0). No permanent or construction impacts are anticipated on these recreation areas.

The additional right-of-way required for Barnhardt Option 1 would require the clearing of 0.97 acres of forest land and impact 1.76 acres of agricultural land.

Barnhardt Option 2

Land cover affected along the Barnhardt Option 2 right-of-way consist of approximately 2.00 miles of open water (84 percent), approximately 0.22 mile of developed, open space (9 percent), approximately 0.07 mile of developed, low/medium intensity land (3 percent), approximately 0.07 mile of forested land (3 percent), and approximately 0.02 mile of agricultural land (1 percent).

Barnhardt Option 2 crosses the Rappahannock River between MPs 0.2 and 2.2. For the Rappahannock River crossing, Barnhardt Option 2 requires 162.37 acres of new permanent right-of-way along the river bottom to accommodate the on average 780 foot right-of-way that includes 14 conduits installed by HDD and associated receiving pits, and 7 submarine cables.. Use of the water trails would not be affected during construction of the Underground Option because boaters can be diverted from construction areas.

Barnhardt Option 2 would cross both the Captain John Smith Chesapeake National Historic Trail and the Lancaster County Rappahannock River Through Trail. Given that this option primarily involves work on the bridge there would be minimal impacts to recreators. However, this option would also involve the removal of all existing structures located within the Rappahannock River. Use of the water trails will not be affected

during construction of Barnhardt Option 2 because boaters can be diverted from construction areas during tower removal. Barnhardt Option 2 is within 0.25 mile of Grey's Point Camp (MP 2.4), Grey's Point Beach and Water Access (MP 2.3), Willaby's Café (MP 0.1) and Rivers Landing Bed and Breakfast (MP 0.0). No permanent or construction impacts are anticipated on these recreation areas.

The additional right-of-way required for Barnhardt Option 2 would require the clearing of 0.98 acre of forest land and impact 1.76 acres of agricultural land.

K. Use of Pesticides and Herbicides

Dominion Virginia Power typically maintains transmission right-of-way by means of selective, low volume applications of EPA-approved, non-restricted use herbicides. The goal of this method is to exclude tall growing brush species from right-of-way by establishing early successional plant communities of native grasses, forbs, and low growing woody vegetation. "Selective" application means the Company sprays only the undesirable plant species (as opposed to broadcast applications). "Low volume" application means the Company uses only the volume of herbicide necessary to remove the selected plant species. These herbicides are routinely applied by hand. DEQ has made previous requests that only herbicides approved for aquatic use by the EPA or the FWS be used in or around any surface water; Dominion Virginia Power intends to comply with this request.

L. Geology and Mineral Resources

Geological Constraints

The Rebuild Project is located within the Coastal Plain geologic province, which consists of a terraced landscape that extends east of Richmond to the Atlantic Ocean. The majority of the province is covered by Quaternary and late Tertiary sand, silt, clay, and gravel that were deposited as a result of fluctuating sea levels during interglacial periods. The upland sub-province located on the western side of the Coastal Plain has an elevation range of 60 to 250 feet and is characterized by steep, stream-dissected slopes. In contrast, the lowland sub-province lies between the upland sub-province and the Atlantic Ocean and has an elevation range of 0 to 60 feet. The lowland sub-province is characterized by flat regions with low relief.

Mineral Resources

NRG identified mineral resource areas through review of publically available Virginia Department of Mines, Minerals, and Energy datasets, USGS topographic quadrangles, and recent digital aerial photographs. There are no mineral resources identified in the Rebuild Project vicinity. The closest sand and gravel pit is located approximately 2.0 miles north of the corridor, north of Irvington Road and east of Irvington Farm Road in Lancaster County.

M. Transportation Infrastructure

Temporary closures of roads could be required during construction of the Proposed Route, the 230 kV Overhead Alternative, the Underground Option, Barnhardt Option 1, and Barnhardt Option 2. No long term impacts to roads are anticipated. The Company will maintain proper clearances between all road surfaces and the conductors and will comply with VDOT requirements for access to the right-of-ways from public roads as well as the aerial and HDD crossings of the roads. At the appropriate time, the Company will obtain the necessary VDOT permits as required.

The Proposed Route, the 230 kV Overhead Alternative, the Underground Option, Barnhardt Option 1, and Barnhardt Option 2 cross the Rappahannock River, which is a Section 10 Navigable waterway. Specifically, Barnhardt Option 1 would require hanging conduits beneath the concrete pile caps of the bridge, which would reduce the vertical clearance of the bridge above the water and could impede boating activities. Vertical clearance of transmission lines over navigable water is defined in 33 CFR 322.5(i.) (Special policies-Power transmission lines) (the "CFR"). The CFR requires electrical lines to be specified heights above the navigational channel. To install the transmission cables under the bridge deck as contemplated in Barnhardt Option 1, the Company's conceptual design shows the cables installed approximately 3-4 feet below the lowest parts of the bridge. Accordingly, the resulting vertical clearance above the navigational channel in the Rappahannock could be in contravention of the CFR requirements. The Company intends to seek guidance from the Army Corps on this clearance issue and supplement the record as appropriate. In addition, the information gained from VDOT regarding this alternative may further inform this issue.

One U.S. Coast Guard ("USCG") USCG aid (marker) to navigation exists offshore of Grey's Point within the Rebuild Project vicinity. This marker is named "9R" and includes a green flashing light.

Proposed Route

The Proposed Route would cross one road, Pinetop Road, at MP 2.1. No impacts on State Route 3 are anticipated during construction or operation of the Proposed 115 kV Overhead Route. Construction of the Proposed 115 kV Overhead Route has the potential to result in minor disruptions to commercial boating activities within the Rappahannock River during the construction of the structures and stringing of cable.

230 kV Overhead Alternative

The 230 kV Overhead Alternative would cross one road, Pinetop Road, at MP 2.1. The 230 kV Overhead Alternative would have the same impacts described above for the Proposed Route.

Underground Option

No impacts on State Route 3 are anticipated during construction or operation of the Underground Option. The Underground Option would cross three roads. Wray Davis Lane is crossed at MP 0.0, Highbank Road is crossed at MP 0.1, and Pinetop Road is crossed at MP 2.3. However, these roads would be crossed via HDD; therefore, the Company does not anticipate disruptions to traffic on these roads.

Construction of the Underground Option is not expected to cause disruption to commercial boating activities within the Rappahannock River as the construction activities within the river are limited to the splice pits, which are located at the edges of the main navigational channel; therefore, any boating activity would be able to easily avoid the construction areas.

Barnhardt Option 1

Traffic on the portion of State Route 3 on the Norris Bridge would be affected during construction of Barnhardt Option 1. As discussed in in Section 2.3 of the Supplemental Alternatives Analysis, during the cable pulling operation, it is estimated that the bridge would be closed to all traffic for up to 35 days. Cable splicing would require up to 48 additional days of lane closures. The Company also anticipates lane closures during operations of the project to allow maintenance to be conducted safety. In addition, lane closures could occur in the event that unexpected repairs are required.

On October 14, 2016, the Company sent a letter to VDOT providing detailed conceptual engineering related to Barnhardt Option 1 and requested VDOT's review and input, including VDOT's future plans for bridge maintenance, inspection and reconstruction. The Company requested a response from VDOT by the end of November. Barnhardt Option 1 would cross three roads. Wray Davis Lane is crossed at MP 0.0, Highbank Road is crossed at MP 0.1, and Pinetop Road is crossed at MP 2.3. These roads are minor residential roads that would be open-cut. The Company anticipates temporary re-routes or the use of steel road plates to maintain access to residences while the duct bank is constructed across or in the case of West Highbank Road immediately adjacent to these roads. The Company would coordinate with the local cities and obtain necessary permits.

No impacts on commercial boating activities within the Rappahannock River are anticipated during construction or operation of Barnhardt Option 1.

Barnhardt Option 2

No impacts on State Route 3 are anticipated during construction or operation of the Barnhardt Option 2.

Similar to Barnhardt Option 1, Barnhardt Option 2 would cross three roads. Wray Davis Lane is crossed at MP 0.0, Highbank Road is crossed at MP 0.1, and Pinetop Road is crossed at MP 2.4. These roads are minor residential roads that would be open-cut. The

Company anticipates temporary re-routes or the use of steel road plates to maintain access to residences while the duct bank is constructed across or in the case of West Highbank Road immediately adjacent these roads. The Company would coordinate with the local cities and obtain necessary permits.

Construction of Barnhardt Option 2 has the potential to result in significant disruptions to commercial boating activities within the Rappahannock River. Barnhardt Option 2 involves trenching across the entire navigational channel. As discussed in Section 2.3, trenching activities within the river are anticipated to take up to three weeks.

During the cable laying operation, there will be a 500- to 1000-foot exclusion area for boating extending between the cable laying vessel to the water jet plow. There is an umbilical line between the laying vessel and the plow that provides water pressure and controls for the submerged plow. This umbilical line is typically floated from the laying vessel to a point where is drops vertically in the water to the plow. All boat traffic would have to be re-routed around this area to avoid damaging the cable laying equipment and boats on the river. As there are seven cables to be installed, there would be either seven or 14 passes of this equipment across the river depending on whether the cables are backfilled at the time of laying or a second pass is required for backfilling.

ATTACHMENTS

White Stone Substation

See Inset

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Miles

1:30,000

N

- Substation
- Transition Station for Underground Route Option
- Proposed 115 kV Overhead Route
- 230 kV Overhead Alternative
- Underground Option
- Barnhardt Option 2
- Route Buffer - Half Mile
- Pollution Discharge Elimination System
- Solid Waste Facility
- Petroleum Release
- VDEQ Registered Petroleum Facility

EPA GeoData

- Air
- Water
- Waste
- Toxic

This information is for environmental review purposes only.

Dominion

Line #65 115 kV Rebuild at Norris Bridge

Contaminated Sites

Attachment 2.E.1

NATURAL RESOURCE GROUP
an ERM Group company

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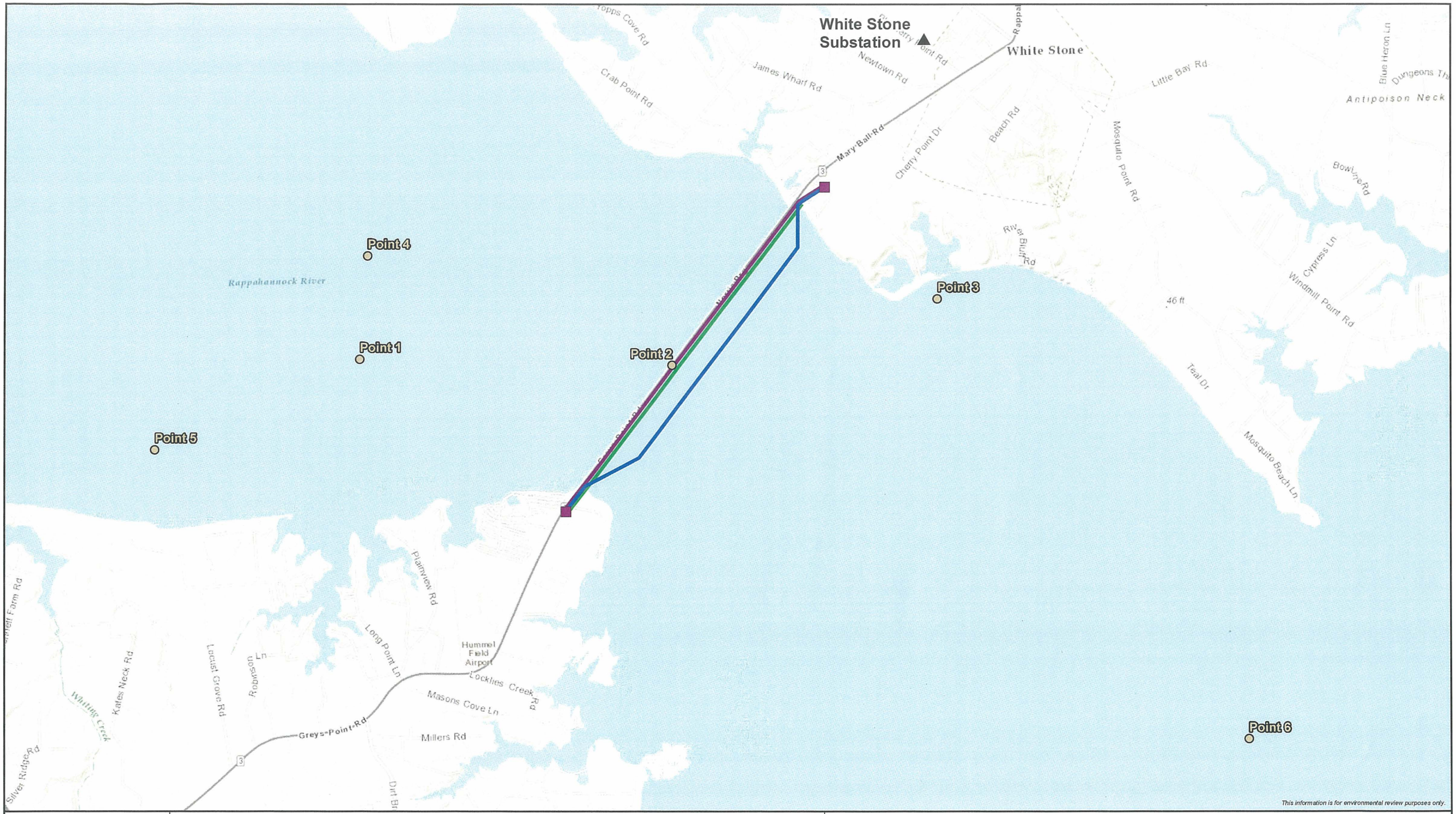
DRAWN BY: JPB



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- Substation
- Transition Station for Underground Option
- Sediment Sample Location
- 115/230 kV Overhead Alternative Routes
- Underground Option
- Barnhardt Option 2

Dominion

Line #65 115 kV Rebuild at Norris Bridge

Sediment Sample Locations

Attachment 2.E.2

NATURAL RESOURCE GROUP
an ERM Group company

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DRAWN BY: JPB

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

Joe Elton
Deputy Director of Operations

Rochelle Altholz
Deputy Director of Administration and Finance

David Dowling
Deputy Director of Soil and Water and Dam Safety

MEMORANDUM

DATE: February 3, 2016

TO: Amanda Mayhew, DOM

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DCR 16-001; DOMINION POWER RAPPAHANNOCK RIVER CROSSING

Division of Planning and Recreation Resources

The Department of Conservation and Recreation (DCR), Division of Planning and Recreational Resources (PRR), develops the *Virginia Outdoors Plan* and coordinates a broad range of recreational and environmental programs throughout Virginia. These include the Virginia Scenic Rivers program; Trails, Greenways, and Blueways; Virginia State Park Master Planning and State Park Design and Construction.

This project crosses the Rappahannock River, a potential Scenic River. However, given the nature of the project, we do not anticipate any appreciable impacts to this potentially scenic resource. If you have any questions about scenic river designation, please see our web site at http://www.dcr.virginia.gov/recreational-planning/document/srdoesdoesnt.pdf or contact Lynn Crump at lynn.crump@dcr.virginia.gov.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

Joe Elton
Deputy Director of Operations

Rochelle Altholz
Deputy Director of Administration
and Finance

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

600 East Main Street, 24th Floor
Richmond, Virginia 23219
(804)786-6124

MEMORANDUM

DATE: May 18, 2015

TO: Jay Woodward, MRC

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: MRC 15-0533, Line 65 Rebuild Utility Crossing

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Norris Bridge Conservation Site is located within the project site. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Norris Bridge Conservation Site has been given a biodiversity significance ranking of B5, which represents a site of general significance. The natural heritage resource of concern at this site is:

Falco peregrinus	Peregrine falcon	G4/S1B,S2N/NL/LT

The Peregrine falcon nests on cliffs, bluffs, talus slopes, old tree hollows, and abandoned nests of other birds of prey (Byrd, 1991). The adult Peregrine Falcon has long and pointed wings, a dark blue or slate back, black on its head and cheeks and white on its throat and sides of its neck. Their belly is barred white and blackish brown and its long, narrow tail is blue-grey with rounded narrow black bands and a white tipped end (Byrd, 1991). The Peregrine Falcon declined dramatically worldwide as a result of pesticide use in the mid-1900's and was once extirpated from east of the Mississippi, including Virginia (CCB, 2006). Once nesting took place in mountainous areas with shear cliffs (CCB, 2006); currently, nesting pairs in

Virginia use artificial structures such as tall buildings, bridge supports, and towers primarily in the coastal plain (Byrd, 1991; CCB, 2006). Intensive reintroduction efforts have been applied in Virginia since the 1970s, and currently the population in Virginia still warrants protection and management.

Threats to the Peregrine falcon include continued exposure to pesticides and human disruption of nesting attempts (Byrd, 1991). Please note that this species is currently classified as threatened by the Virginia Department of Game and Inland Fisheries (VDGIF).

DCR recommends a time of year restriction on all bridge work from 15 February to 15 July of any year. Due to the legal status of Peregrine falcon, DCR also recommends coordination with Virginia's regulatory authority for the management and protection of this species, the VDGIF, to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/or contact Angela Weller at 804-364-8747 or Angela.Weller@dgif.virginia.gov.).

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Cc: Amy Ewing, VDGIF

Literature Cited

Byrd, M.A. 1991. Peregrine Falcon. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company, Blacksburg, Virginia. p. 499-501.

Center for Conservation Biology. 2005. VAFalcons. Accessed at: http://ccb-wm.org/vafalcons/species/species.htm on April 22, 2010.

-----Original Message-----
From: Jennings, Adrian R. NAO [mailto:Adrian.R.Jennings@usace.army.mil]
Sent: Tuesday, July 14, 2015 5:52 AM
To: Gray, Corey
Cc: Woodward, Jay (MRC)
Subject: RE: Va Power (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Concur; no effect on Atlantic Sturgeon.

Any variance of TOY for Anad Fish will have to be reviewed/concurred by COE as it is expected to be a Permit Condition.

Adrian

Adrian R. Jennings
Environmental Scientist
Northern Virginia Regulatory Section
Norfolk District, Corps of Engineers
(804) 435-9362

The Norfolk District is committed to providing the highest level of support to the public. In order for us to better serve you, we would appreciate you completing our Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. We value your comments and appreciate your taking the time to complete the survey.

-----Original Message-----
From: Gray, Corey [mailto:Corey.Gray@stantec.com]
Sent: Monday, July 13, 2015 2:56 PM
To: Jennings, Adrian R. NAO
Subject: [EXTERNAL] RE: Va Power (UNCLASSIFIED)

Adrian,

I am working with VMRC/VIMS on mitigation measures to be used to allow construction during the typical time of year restriction to protect anadromous fish. In their comment letter, VIMS mentioned the Atlantic sturgeon. Did NMFS concur with the Corps' determination of no effect or not likely to adversely affect sturgeon? If so I just would like to note to VMRC and VIMS that the Corps and NMFS have determined that there will be no issues with the sturgeon. Thanks.

Corey Gray
Senior Environmental Scientist
Stantec
5209 Center Street, Williamsburg VA 23188-2680
Phone: (757) 220-6869
Cell: (757) 812-0158
Fax: (757) 229-4507

Corey.Gray@stantec.com
stantec.com

-----Original Message-----
From: Jennings, Adrian R. NAO [mailto:Adrian.R.Jennings@usace.army.mil]
Sent: Tuesday, July 07, 2015 2:08 PM
To: Gray, Corey
Subject: RE: Va Power (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

No effect for 106 and/or ESA issues (the ESA review took place prior to the listing of the bat so the rule is to accept conditions at the time of review; no effect). Plus any tree removal that you may anticipate, but did not list in the permit application, is outside of the permit area.

Best regards,
Adrian

Adrian R. Jennings
Environmental Scientist
Northern Virginia Regulatory Section
Norfolk District, Corps of Engineers
(804) 435-9362

The Norfolk District is committed to providing the highest level of support to the public. In order for us to better serve you, we would appreciate you completing our Customer Satisfaction Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. We value your comments and appreciate your taking the time to complete the survey.

-----Original Message-----
From: Gray, Corey [mailto:Corey.Gray@stantec.com]
Sent: Tuesday, July 07, 2015 12:53 PM
To: Jennings, Adrian R. NAO
Subject: [EXTERNAL] RE: Va Power (UNCLASSIFIED)

Thanks. The application modification simply eliminated the 4-pile foundation system so that all structures will now use the 2 or 3 pile systems. Impacts went down. The primary questions I have for you is whether you foresee any Section 106 or Endangered Species Act issues. We don't think there are any; however, we anticipate that there may be a time of year restriction on any tree removal due to northern long-eared bat. We also don't anticipate any issues with northeastern beach tiger beetle or

Atlantic sturgeon, although they have been documented in the area. It looks like this project may be heading to VMRC this month. Look forward to catching up.

Corey Gray
Senior Environmental Scientist
Stantec
5209 Center Street, Williamsburg VA 23188-2680
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-----Original Message-----
From: Jennings, Adrian R. NAO [mailto:Adrian.R.Jennings@usace.army.mil]
Sent: Thursday, July 02, 2015 3:27 PM
To: Gray, Corey
Subject: Va Power (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Corey: yes, I received the modified piling proposal for the Va Power/Rappahannock River project. No, I haven't looked at 'em. This is a very busy time of the permit year and a modification request can break the stride. I will get back with you after the holiday.

Have a great 4th,

Adrian

Adrian R. Jennings
Environmental Scientist
Northern Virginia Regulatory Section
Norfolk District, Corps of Engineers
(804) 435-9362

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COMMONWEALTH of VIRGINIA

Molly Joseph Ward
Secretary of Natural Resources

Department of Historic Resources
2801 Kensington Avenue, Richmond, Virginia 23221

Julie V. Langan
Director

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February 10, 2016

Ms. Amanda Mayhew
Dominion Virginia Power
P.O. Box 26666
Richmond, VA 23261

Re: Rappahannock River Transmission Line (Line #65) Rebuild Project
Lancaster and Middlesex Counties, VA
DHR File No. 2015-0969

Dear Ms. Mayhew:

Thank you for initiating consultation with DHR on the project referenced above. The project, as presented, is the rebuild of 2.2 miles of existing transmission line across the Rappahannock River at the Route 3 (Norris) bridge. Our comments are provided as assistance to Dominion Virginia Power (Dominion) in the preparation of an application to the State Corporation Commission (SCC). We have previously provided comments to the Army Corps of Engineers on this project and reserve the right to provide additional comment through the Federal Section 106 process.

The Army Corps considered the project's impacts on Pops Castle (DHR ID #051-0075), which is listed in the National Register of Historic Places and concluded consultation with a finding of no adverse effect. The Army Corps' limited its analysis to Pops Castle and did not complete cultural resources survey. In accordance with Section I of the DHR's *Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia*, we recommend that a pre-application analysis be prepared and submitted to DHR. Once an alternative is approved by the SCC, we are likely to recommend full architectural and archaeological studies and mitigation of all moderate to severe impacts to VLR/NRHP-eligible resources.

We look forward to working with Dominion throughout this project. If you have any questions, please do not hesitate to contact me at roger.kirchen@dhr.virginia.gov.

Sincerely,

Roger W. Kirchen, Director
Review and Compliance Division

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