An Assessment of Significant Impacts Which Challenge the Option

 of Issuance by the Virginia State Water Control Board of a 401 Water

 Quality Certification for the Atlantic Coast Pipeline

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Summary Statement

The Virginia State Water Control Board will be extremely challenged to find evidence of reasonable assurances that construction and existence of the ACP will not violate Water Quality Standards in 9VAC25-260-5, et seq. and elsewhere in state law. Uncontrollable sedimentation due to insufficient Best Management Practices and increased stormwater runoff and a high probability of landslides, changes in rainwater infiltration and groundwater recharge of streams and springs, and resulting degradation to streams will be impossible to prevent due to the scope of pipeline construction on an unprecedented scale. Extremely steep, often unstable slopes with up to 80% grades or more, documented history of frequent landslides, sensitive karst terrain and 14.4 miles of acid producing rock formations along the first 85 +/- miles of the ACP in western Virginia will undoubtably impact both the quality and quantity of surface and groundwater in several Virginia counties.

1. **Inadequacies in Dominion’s Construction, Operations and Maintenance Plan,**

**Erosion and Sediment Control Plan and Stormwater Management Plan and Calculations**

There is a very limited list of erosion and sediment controls ( BMP’s) in Dominion’s Erosion and Sediment Control plan and Dominion’s Annual Standards and Specifications approved by DEQ. The construction plan sheets shown so far are on too small a scale to show enough detail and for anyone to analyze them effectively. BMP’s only include temporary diversion dikes, various grades of silt fence and belted silt retention fence, compost filter socks, temporary slope breakers, trench plugs, erosion control blankets such as Flexterra and vegetative stabilization.

Dominion does not propose to use rock check dams, temporary sediment traps or temporary sediment basins, all of which are critical to effective erosion control and retention of sediment laden runoff. While silt fence has been rated at only 40 to 50 percent effectiveness in retaining sediment from runoff, sediment traps and basins have a 60 percent effectiveness rating if sized properly for the drainage area and constructed and stabilized properly. Virginia Stormwater Management Regulations and guidance documents note that sediment basins are the only BMP which is capable of “ detaining the water quality volume for release over 48 hours, or detaining and releasing over a 24-hour period the expected rainfall resulting from the one-year, 24-hour storm.” In Dominions Appendix ‘X’ of the recently submitted construction plans, there are no sediment basins.

From personal experience, silt fence is only as good as its degree of proper installation, especially at all relative low points in the terrain. On the ACP mountain slopes, shallow bedrock will often be too close to the surface for proper silt fence installation and the soils will have numerous cobbles and larger rock fragments on many areas, limiting proper entrenchment of the fabric. Numerous tree roots along the cleared boundaries could impact proper silt fence installation and many boundaries where silt fence would be parallel to the slope will easily wash out. Construction inspectors usually inspect silt fence conditions infrequently and often from the seat of a truck instead of carefully walking along the entire line of silt fence.

Temporary and permanent slope breakers and diversion dikes would need enough soils with adequate clays or silts and moisture to achieve the needed compaction to be effective. The miles of thin, rocky and sandy, gravely soils on mountain slopes would not be adequate for slope breakers or diversion dikes to be effective.

There are over 50 miles of the ACP corridor within the 4 western counties of Highland, Bath, Augusta and Nelson which meet the DEQ criteria for its *List of Potential Critical Areas*, most with slopes > 15% : high erosion hazard and critical with these same slope lengths exceeding 75 feet. Many have moderate to high erodibility of soils, soils less than 5 feet deep and flow to environmentally sensitive areas. The reality of this physical challenge to having an effective suite of BMP’s for site-specific plans adequate enough to prevent degradation of water resources onsite and downslope, is that **all available erosion and sediment control devices** listed in the Va. Erosion and Sediment Control Handbook and other commercial BMP’s **must be used** wherever needed.

Dominion has determined 39.1 miles of ACP corridor plus 25.7 miles of access roads in the counties of Highland, Bath, Augusta, and Nelson meet the criteria for Best in Class slope stability analysis; > 30 percent slope for over 100 feet. So far, only two critical steep sites on the National Forests, including one in Virginia for just 0.1 mile at milepost 85, have been analyzed for BMP’s needed to achieve slope stability and thus protect streams at the base of the slope. These required extreme measures like heavy wire mesh blankets and 8 foot soil nails to hold them in place.

Convenience to a pipeline company and limiting costs **cannot be a factor** in plan approval and variances are a slippery slope. Dominion has or will ask for a variance for Minimum Standard 16a: limiting open trench lengths to 500 feet, generally for their convenience.

This variance has been granted many times in the past, up to over a mile. Imagine what will happen with miles of slopes steeper than 30 percent and up to 70 percent or more, many over ¼ mile long, all with the 8 to12 feet wide at the bottom pipeline trench in highly erodible soils. These super drainage channels will be conduits for copious volumes of sediment laden runoff, which would only be nominally mitigated by trench breakers. High value first and second order streams, including native brook trout streams and other sensitive habitats, will be at certain risk of permanent degradation.

Detailed cross sections and cut and fill sheets are still needed for every 100 feet along the ACP route. These are significant to proper E & S control plan and stormwater runoff analysis. The runoff calculations done by the consultants and shown in Appendix ‘X’ use HUC units for drainage basins of 10,000 to over 40,000 acres instead of the smaller, appropriate catchment areas procedure which in the case of the ACP is often 200 acres or less. Incorrect assumptions are made about the ground cover runoff factor; the runoff calculation curve numbers are weighted for the inappropriately sized drainage areas and a curve number for shrub land was used instead of the more appropriate number for managed turf.

1. **Stream and Spring Degradation Due to Changes in Runoff, Rainfall Infiltration and Groundwater Flow Paths**

There would be 722 waterbody crossings by the ACP in Virginia, including 69 wild trout streams or unnamed tributaries to them and 4 additional stockable trout streams. This does not include many first and second order headwater streams and intermittent channels which are close enough on the downslope side of the pipeline corridor to be impacted by runoff from excavated areas. The resulting degradation of these high gradient headwater stream areas will have the following impacts: Decreases in rainfall infiltration, decreases in groundwater tables, quantities and availability due to deforestation, soil compaction and dewatering of trenches. Thus flow to seeps and springs and groundwater baseflow to receiving streams will be reduced. Due to decreasing the water quantity this is not consistent with Code of Virginia &62.1-11.

( Dodds, 2017)

Degradation of aquatic habitat for macroinvertibrates will result from sedimentation and deforestation and receiving streams will also be degraded. Calculations for runoff soil loss provided by Dominion have been limited to two areas and they showed increases in soil loss( sediment production) of 246 to 277 times the preconstruction values using RUSLE formulas. ( Dodds, 2017)

According to Final EIS by FERC, all coldwater or trout streams occur between mileposts 85 and 164.4 on the AP-1 mainline, west of Rte. 29. This is also the area with the largest concentration of steep, woody slopes which are most vulnerable to extreme erosion and sediment generation due to construction operations and deforestation.

The proposed access roads would add another 89 stream crossings, 31 of which are wild trout or stockable trout streams or their tributaries. The inadequate erosion and sediment control plans for these roads will lead to many sites of stream degradation.

Even the regrading and improvement of existing roads will have negative impacts.

Trout streams definitely at risk from ACP construction include Townsend Draft, Erwin Draft, Jackson River, Little Valley Run, Bolar Run, White Oak Draft, Jennings Branch, Ramseys Draft, Back Creek and numerous others. ( DPMC Critical Zones Map) Other pristine waters with rare or endangered species include Cowpasture River with its James Spiny Mussels, river otters and bald eagles in the ACP crossing area. Acidic shale bedrock along this river corridor will easily cause degradation of pH and other chemical factors in the nearby unnamed tributaries and the Cowpasture.

The deforestation of construction areas and the fact that soil functions cannot be restored to pre-existing conditions will result in increased stormwater discharge from upland slopes, stream bank erosion and stream embeddedness. Many rainfall events will result in increased stream flow, more frequent flooding and bank erosion. ( Dodds, 2017)

1. **Extreme Landslide Dangers: Increase in Slope Instability Due to Construction and the Threat of Slides and Debris Flows Impacting Drainage Hollows and Streams**

The Final EIS released by FERC for the ACP notes that the project would cross 28.8 miles with slopes of 20 to 35 percent and 12.5 miles of slopes greater than 35 percent and further noted that 28 percent of the AP-1 mainline in Virginia” would cross areas with a high incidence of and high susceptibility to landslides(Highland, Bath, Augusta and Nelson Counties); 21 percent would cross areas with a moderate incidence of and high susceptibility to landslides ( Augusta, Nelson and Buckingham Counties)”. Geosyntech Consultants working for Dominion identified over 100 possible slope instability hazard locations on the AP-1 mainline in Virginia with evidence of or potential for landslides.

The Dominion Pipeline Monitoring Coalition has an interactive Critical Zone Map which clearly shows steep slope areas, high excavation areas, soil erosion hazard sites and geologic formations of concern in great detail for nearly the first 200 miles of the ACP in Virginia. ( DPMC C Z Map)

There is documented evidence of over 10,000 landslides, including many debris flows which impacted drainage hollows and surface waters ( Cameron-Compilation 2017). Major Rainfall events causing landslides in the ACP area in Virginia’s mountains included

a summer cloudburst in 1949 which caused debris flows in northwestern Augusta County, Hurricane Hazel in 1954, Hurricane Camille causing 3800 slides and debris flows in Nelson County in 1969, the flood of 1985 from tropical system Juan, a summer cloudburst in Madison and Albemarle counties in 1995 creating debris flows that moved truck-sized boulders, landslides in Highland County in 1996, landslides along the ACP path in Bath County in 2015 and numerous landslides in Allegheny County in June of 2016. Major landslide events in our Allegheny Mountains have occurred on an average of every 9 years since 1949, but the recurrence interval appears to be decreasing in this century, probably due to climate change.

FERC’s FEIS for the ACP notes that “natural landslides may occur during construction, operation or maintenance of the ACP” and that a variety of mass movements downslope which may occur in the project area include debris slides, debris flows, rockslides, rockfalls and slumps. According to studies by L. S. Eaton of JMU, Wooten, Morgan, Hack and Goodlett and other geomorphologists, debris flows are the dominant type of rapid, often catastrophic mass movement in the Blue Ridge and Allegheny Mountains of Virginia, West Virginia and North Carolina. I was told by Prof. L. S. Eaton of JMU that many hundreds of unstable sites in these local mountains are “ like a loaded gun” waiting for a major rainfall event to trigger them. Most of these landslides and debris flows are initiated at sites near the crest of narrow mountain ridges, in steep drainage hollows where bedrock types and orientation, soil types, groundwater levels and the weight of colluvium overburden all combine with severe rainfall events to reach critical levels of slope stability. The ACP will traverse about 19 miles of such ridges in Virginia’s mountains and excavation along them will require cutting down up to 20 feet or more off of the ridgetops. Many of these ridges have tons of loose sandstone or quartzite talus rock overlying softer, less competent shales, mudstones and siltstones, making them inherently unstable and vulnerable to heavy rainfall or manmade disturbance.

Debris flows initiated by heavy rains can travel hundreds to thousands of yards downslope and have traveled up to 1 ½ miles in the case of the June 1949 event in Pendleton County West Virginia. That debris flow closed a major highway and temporarily dammed the South Branch of the Potomac River near Petersburg. (Cameron, 2017) The same geologic formations and slopes at the initiation site of that event on North Fork Mountain are found along part of the ACP route further south. A major rockslide in Saint Marys Wilderness in 2003 temporarily blocked Saint Marys River and caused a significant channel relocation. There certainly are similar talus slopes on several miles of the ACP route.

Construction and other land disturbance by man can increase landslide potential by undercutting or overloading slopes, changing soil infiltration and diverting subsurface drainage and by removing the stabilizing root systems of trees and shrubs. (Golder and Associates, 2016)

The Final EIS for the ACP also notes that project-induced landslides may result from the construction, operation and maintenance of the pipeline, including from fill slopes and alteration of surface and subsurface drainage. Inadequately constructed and maintained fill slopes are a source of debris flows in Virginia’s mountainous areas, as noted in several landslide studies.

One example of this is the series of at least 9 landslides in Little Valley in Bath County that occurred when 4 inches of rain from a thunderstorm fell in July, 2015. The largest slide traveled 450 feet downslope on Little Mountain, covered about ½ acre and was in a location that had been logged in the previous year. The slide began at the edge of a new logging road and this location is only 300 feet south of the proposed ACP centerline. This slide also overlaps a boulder strewn site of a larger, late prehistoric landslide. Many of these slides and those from the last 75 years are evident in the colluvium on the slopes of Little and Jack mountains along or close to the ACP path.

 ( Cameron- Little Valley, 2016)

1. **Potential Impacts of Acid Producing Bedrock on Groundwater and Streams**

Disturbance of acid producing bedrock in surface areas exposed to rain or groundwater can result in the production of harmful leachates such as sulfuric acid from black shales and other rocks containing iron pyrite. This occurs frequently from coal mining operations in the Central Appalachians and elsewhere and must be mitigated to prevent impacts to surface and groundwater quality.

The ACP route passes through 9.4 miles of the Millboro-Needmore Formation, a black Devonian shale with varying concentrations of iron pyrite. This would be in Highland, Bath and Augusta counties where many pristine streams such as the Cowpasture and Jackson Rivers, the Back Creek in Highland Co. and trout streams such as Hughart Run, Hamilton Branch and Mill Creek, as well as unnamed tributaries to them, would be impacted. I’m personally familiar with cases where the Virginia Department of Transportation has had to deal with acidic leachates from this and other formations in these counties and elsewhere, often in ditchlines and stream channels through road culverts.

One site with acid leachate problems is further upstream from the ACP on the Cowpasture River where Rte. 250 was widened and the bridge replaced in the 1990’s. The road cut is into Millboro shale and the leachate has prevented revegetation of the slope and has concentrated in the north side ditch and, luckily flows into a stormwater basin at the edge of the floodplain. The acid leachate continues to react with the concrete lined ditch and the inlet culvert and riser of the stormwater basin, possibly impacting wetlands adjacent to the basin.

The worst case, in my personal experience as a VDOT Environmental Engineer, is in Clifton Forge where I-64 crosses a very large fill of Millboro shale over Dry Creek. The interstate was built in the 1970’s and an apparent spring or perched water table in the fill at the upstream end of the large box culvert provides a constant water source that fluctuates in level and reacts with the iron pyrite. The acid leachate has and continues to react with the concrete in the culvert walls, eat away at steel rebar and discharges into the creek through joints in the culvert walls. The pH of the leachate water has been measured over the years and consistently runs between 4.2 and 5.0 in several joint seeps. Benthic surveys of the creek over several years showed normal invertebrates and minnows upstream and **a dead zone for ¼ mile downstream of the culvert**.

DEQ issued a directive to VDOT to mitigate this situation in the early 1990’s, but there is no space to collect the acidic leachate and provide an acid neutralization site for this without blocking and further impacting the creek. Attempts to work with the City of Clifton Forge on piping and diversion to their sewage treatment site were not successful and closing the interstate to replace much of the fill is not an option.

Excavation for the ACP through Millboro shale and other formations, such as the Candler meta-phyillite and schist in Nelson and Buckingham Counties, will become problematic as well at small streambeds, in floodplains adjacent to streams, through spring and seep areas and in low points in mountains and hillsides where runoff and groundwater will concentrate. All of these sites will have periodic and seasonal fluctuations in the near-surface water table which provides the setting for breakdown of the iron pyrite into iron oxide and sulfuric acid. Excavation for the pipeline trench up to 12 feet deep, for leveling steeper ground and narrow ridges to work safely, for access roads and for extra work spaces and staging areas will disturb the problem shale.

Although cathodic protection is proposed to minimize corrosion of the pipeline itself, it will not mitigate most of the 9.4 mile path of 125 to 200 foot wide disturbance of Millboro shales and more than 25 miles in other potentially acid-producing rock formations. Permanent trench breakers would need to be completely impermeable to isolate areas of acid leachate and would not prevent most impacts to near-surface groundwater and all backfill of spoils would need to have the Millboro shales and other similar rock removed wherever they have a chance to be in perched groundwater. Thus, many thousands of tons of waste will need to be hauled to sites which would need to stay high and dry, often increasing landslide risks and increasing soil compaction.

These acidic shale areas will be difficult to revegetate as experience with Millboro shales show. This will increase runoff and mobilization of sediments with resulting negative impacts to streams and dry channels downslope.

The acidic leachate will make its way into first order headwaters of many trout streams and nearby springs, many of which provide drinking water for residences and communities. Many trout streams are already impaired by elevated pH levels and any additional acidic inflow will jeopardize habitat for trout and benthic organisms they depend on. Blasting and hoe ram excavation for the pipeline trench will fracture bedrock and can easily lead to impacts to karst groundwater where Millboro shale is adjacent to or not far upslope from limestone formations.

**Conclusion**

ACP construction will result in significant impacts and degradation to both headwater channels and streams and larger waters and springs which must be protected under the provisions of the Section 401 Water Quality Certification. The steep slopes, adverse soils and geology and inadequate plans for mitigation of construction impacts will be an extreme challenge to attain compliance with Virginia laws protecting water quality and quantity.

I have a personal stake in these stream and upland impacts; I hike, camp, fish and travel and maintain trails in many of these waters and upland areas on public lands and those owned by friends. I cannot bear to think of the massive degradation to be brought by the ACP.

References

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