NOTICE OF OBJECTION TO THE DRAFT RECORD OF DECISION FOR THE ATLANTIC COAST PIPELINE PROJECT LAND AND RESOURCE MANAGEMENT PLAN AMENDMENTS FOR THE MONONGAHELA NATIONAL FOREST, POCAHONTAS COUNTY, WEST VIRGINIA, THE GEORGE WASHINGTON NATIONAL FOREST IN HIGHLAND, BATH, AND AUGUSTA COUNTIES, VIRGINIA

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SUMMARY STATEMENT

The Forest Service (FS) proposes to authorize amendments to the Land and Resource Management Plans (LRMPs) for Monongahela National Forest (MNF) and the George Washington National Forest (GWNF) in order to provide a special use permit for the proposed Atlantic Coastal Pipeline (ACP) project to cross FS lands. Plan amendments proposed in the FS Draft Record of Decision (DROD) would facilitate the proposed ACP crossing of approximately 5 miles of lands managed by the MNF and approximately 16 miles of lands managed by the GWNF. The proposed FS amendments are not consistent with "**36CFR§219.8 Sustainability**". The proposed FS amendments are directly related to the substantive requirements (**36CFR§219.8 - §219.11**) of the FS planning relation: address sustainability, diversity of plant and animal communities, multiple use, and timber requirements.

The ACP construction would result in the following detrimental impacts to sustainability:

1) **Decrease in the groundwater table, groundwater quantities, and hydraulic head of groundwater** due to deforestation, soil compaction, and trench dewatering. This results in **decreased groundwater** available 1) to maintain seeps and springs which supply water to headwater areas, including wetlands, in first order stream watersheds, and also 2) to maintain groundwater baseflow to provide water to receiving streams during times of drought. **This is inconsistent with the 36 CFR 219 planning rule § 219.8(a)(2)(iv)** – [The plan must include plan components to maintain or restore …] "Water resources in the plan area, including lakes, streams, and wetlands; … and other sources of drinking water (including guidance to prevent or mitigate detrimental changes in quantity, quality, and availability)". **This is also inconsistent with Code of Virginia, Title 62.1**. **Waters of the State, Ports and Harbors" under "§ 62.1-11. Waters declared natural resource; state regulation and conservation; limitations upon right to use,** F. The quality of state waters is affected by the quantity of water and it is the intent of the Commonwealth, to the extent practicable, to maintain flow conditions to protect instream beneficial uses and public water supplies for human consumption.

2) **Degradation of conditions, specifically increased light and temperatures** due to deforestation, in headwater areas of first order streams. Filtered light and lower temperatures in headwater areas are required to sustain aquatic habitats for aquatic macroinvertebrates at the base of the food chain. **This is inconsistent with the 36 CFR 219 planning rule requirement § 219.8(a)(3)(i)** – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity". **This is also inconsistent with 9VAC25-260-20 (Water Quality Standards), which includes limits on increases in stream temperatures** and **Code of Virginia, Title 62.1**. **Waters of the State, Ports and Harbors" under "§ 62.1-11. Waters declared natural resource; state regulation and conservation; limitations upon right to use,** F. The quality of state waters is affected by the quantity of water and it is the intent of the Commonwealth, to the extent practicable, to maintain flow conditions to protect instream beneficial uses and public water supplies for human consumption.

3) **Degradation of ecological connectivity** for the river continuum due to destruction of aquatic habitats in headwater areas of first order streams. Destruction of the aquatic habitats for macroinvertebrates at the base of the food chain in headwater areas will disrupt connectivity with downstream aquatic organisms. This is **inconsistent with the 36 CFR 219 planning rule requirement § 219.8(a)(3)(i)** – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity". **This is also inconsistent with Code of Virginia, Title 62.1**. **Waters of the State, Ports and Harbors" under "§ 62.1-11. Waters declared natural resource; state regulation and conservation; limitations upon right to use,** F. The quality of state waters is affected by the quantity of water and it is the intent of the Commonwealth, to the extent practicable, to maintain flow conditions to protect instream beneficial uses and public water supplies for human consumption.

4) **Degradation of receiving streams** within watersheds crossed by the proposed ACP construction due to **increased sedimentation**, causing increased turbidity and embeddedness. Increased turbidity causes reduced water quality for filter feeding aquatic organisms and also obstruction of gills in fish. **This is inconsistent with the 36 CFR 217 planning rule § 219.8(a)(2)(ii)** – [The plan must include plan components to maintain or restore …] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation". **This is also inconsistent with Code of Virginia, Title 62.1. Waters of the State, Ports and Harbors, Chapter 3.1 State Water Control Law, Article 2.4 Erosion and Sediment Control Law § 62.1-44.15:52**, and **9VAC25-260-20 (Water Quality Standards)**.

5) **Deficiencies in Best Management Practices**: the Best Management Practices described for use during the proposed ACP construction are deficient and will result in **increased sedimentation** to receiving streams and increased embeddedness. The BMPs listed by ACP for use at the proposed construction areas do not include sediment basins, which would constitute the only BMP 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. Additionally, there are no sediment basins shown on the construction plans submitted in Appendix X, provided to the Virginia Department of Environmental Quality (VDEQ). **This is inconsistent with §62.1-44.15:52 because of ineffective control of soil erosion and sediment deposition which will result in unreasonable degradation of stream water and stream channels. This is inconsistent with the 36 CFR 217 planning rule § 219.8(a)(2)(ii)** – [The plan must include plan components to maintain or restore …] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation".

6) **The RUSLE calculations provided by ACP are deficient** because they were provided for two areas of unknown location in Bath County, VA. The slope length of 100 feet was selected to pertain to that required for slope breakers as a BMP. In the first example, there was an increase from pre-construction soil loss of 0.015 tons per acre per year (t/ac/yr) to post-construction soil loss of 3.7 t/ac/yr, which is an increase of 246 times the pre-construction amount. In the second example, there was an increase from pre-construction soil loss of 0.022 tons per acre per year (t/ac/yr) to post-construction soil loss of 5 t/ac/yr, which is an increase of 227 times the pre-construction amount. This verifies increases in release of sediment to receiving streams as a result of ACP construction activities. **This is inconsistent with §62.1-11 and §62.1-44.15:52 and 9VAC25-260-40 because construction impacts will cause sedimentation to the receiving stream, resulting in increased embeddedness in the receiving stream, causing degradation of aquatic habitats.** This is **inconsistent with the 36 CFR 219 planning rule requirement § 219.8(a)(3)(i)** – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity".

7) **Inadequate assessment of landslide potential and seismic activity potential**. The proposed ACP route is in close proximity to the Central Virginia Seismic Zone, where the epicenter of the Mineral, Virginia earthquake occurred. Liquefaction of soils was reported during the earthquake. If soil liquefaction occurs where the soils are supporting a pipeline, the soils could collapse and a pipeline rupture could occur where the pipeline is not supported. Colluvium has been observed by ACP on numerous steep slopes along the proposed ACP route. Colluvium is defined as sediment which continually moves downslope as a form of soil landslide. Because earthquakes are known to cause landslides, the steep slope areas would be subject to greater landslide activity during an

earthquake. Soil moves downslope during a landslide, delivering sediment to receiving streams and thus causing increased turbidity and embeddedness in receiving streams. **This is inconsistent §62.1-11 and §62.1-44.15:52 because the increased sedimentation to receiving streams will result in degradation of the stream water and aquatic habitats and will impair beneficial uses of the receiving streams.** Additionally, **9VAC25-260-20** (Water Quality Standards) explains that turbidity is a substance to be controlled because it can be harmful to aquatic life. **This is inconsistent with the 36 CFR 219 planning rule §219.8(a)(2)(iv)** – [The plan must include plan components to maintain or restore …] "Water resources in the plan area, including lakes, streams, and wetlands; … and other sources of drinking water (including guidance to prevent or mitigate detrimental changes in quantity, quality, and availability)".

8) **ACP did not provide Best Available Scientific Information**. ACP did not provide peak stormwater discharge calculations for proposed construction areas in West Virginia. ACP presented peak stormwater discharge calculations, performed by Environmental Resources Management (ERM), for proposed construction areas in Virginia. Parameters used in the TR-55 calculations included curve numbers for ground covers that indicated no change in ground cover for pre-construction and post-construction conditions and used excessively large drainage areas on the HUC12 Subwatershed order of magnitude rather than using watersheds of functionally significant first order streams, second order streams, or third order streams. The peak stormwater discharge results are, therefore, misrepresentative and are **inconsistent with 36 CFR 219 planning rule §219.3 which specifies using the Best Available Scientific Information (BASI) to Inform the Planning Process.**

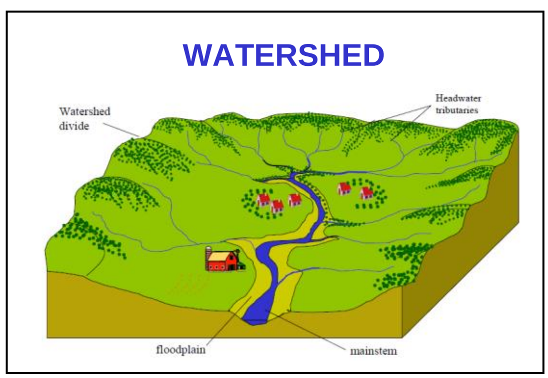
9) **Cumulative and permanent degradation of receiving streams and reduced groundwater quantities** will result from deforestation, soil compaction, seep diversion, and trench dewatering in upland areas crossed by the proposed ACP construction. Increased stormwater discharge results from deforestation, soil compaction, seep diversion, and trench dewatering (which directs water within trenches to the ground surface). Cumulative and permanent impacts will also result from reduced groundwater recharge due to deforestation, soil compaction, and trench dewatering. **This is inconsistent with §62.1-44.15:52 or 9VAC25-260-40 because the construction areas will not be reforested and soil functions cannot be restored to pre-construction conditions, thereby resulting in continual increased stormwater discharge, which will cause downstream stream bank erosion, resulting in increased embeddedness. The decreased groundwater recharge will lower the water table and the hydraulic gradient such that water will not be available to seeps and springs in the headwater areas of high gradient first order streams or downstream as groundwater baseflow for streams during times of drought. The impact is cumulative because numerous upland first order stream tributaries to higher order streams will increase sediment transport and stream bank erosion downstream. This is inconsistent with the 36 CFR 217**

planning rule §219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore …] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation". This is inconsistent with the 36 CFR 219 planning rule §219.8(a)(2)(iv) – [The plan must include plan components to maintain or restore …] "Water resources in the plan area, including lakes, streams, and wetlands; … and other sources of drinking water (including guidance to prevent or mitigate detrimental changes in quantity, quality, and availability)".

1.0 ACP EVALUATION OF UPLAND WATERSHEDS IS DEFICIENT

The definition of a watershed is provided in "9VAC25-870-10. Definitions": "Watershed" means a defined land area drained by a river or stream…". In the Unified Stream Methodology (USACE, 2007), "watershed" is referenced as a "stream's watershed". The Virginia Stormwater Management Handbook (2013) provides the following definitions: "Watershed - A defined land area drained by a river or stream, karst system, or system of connecting rivers or streams such that all surface water within the area flows through a single outlet" and "Watershed Area - All land and water within the confines of a drainage divide" and "Drainage Basin - A geographical area or region where the earth's surface is so sloped and contoured that surface runoff from streams and other natural watercourses flows by gravity to a given location or common outlet at some point along a stream channel." **Figure 1.0-1** depicts a watershed, showing the watershed divide (or drainage divide) along the highest elevations, the headwater tributaries, and the larger stream receiving water from the headwater tributaries.

Figure 1.0-1 – Headwaters of first order stream tributaries are located at the highest elevations on the watershed divides.



A watershed can refer to the overall system of streams that drain into a river, or can pertain to a smaller tributary. Stream order is a measure of the relative size of streams. The smallest tributary is a first order stream, which originates in the highest elevations. Strahler (1952) defined a hierarchy of stream tributaries to depict the relationships of stream order. Where two first order streams connect, a second order stream is designated. Where two second order streams connect, a third order stream is designated (**Figure 1.0-2**).

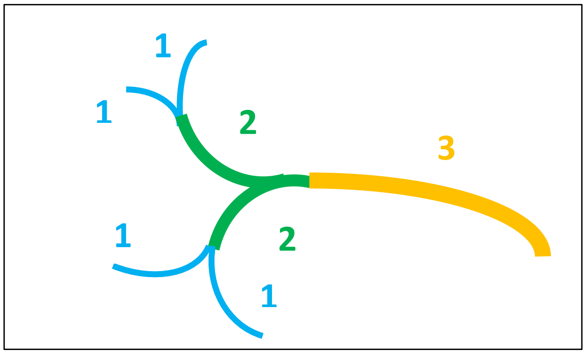


Figure 1.0-2 – Schematic diagram of the relationship of first order streams (designated "1", shown in blue), second order streams (designated "2", shown in green), and third order streams (designated "3", shown in orange). First order streams form in headwater areas at the highest elevations in watersheds. (Diagram based on Strahler, 1952).

1.1 Watershed Sizes

The Federal Government Agencies have established a hierarchical ordering of Hydrological Unit Codes (HUC), described as areas of land upstream from a specific point on the stream (generally the mouth or outlet) that contributes surface water runoff directly to this outlet point (**Table 1.1-1**). HUC designations were developed by Seaber, Paul R., F. Paul Kapinos, and George L. Knapp ("Hydrologic Unit Maps", U.S. Geological Survey Water-Supply Paper 2294; 1987) as a "standardized base for use by water-resources organizations in locating, storing, retrieving, and exchanging hydrologic data, in indexing and inventorying hydrologic data and information, in cataloging water-data acquisition activities…" HUC-8 Subbasin designations were based on a drainage area of greater than 700 square miles (448,000 acres). The smallest HUC is the HUC-12 Subwatershed, which typically encompasses an area from 10,000 acres to 40,000 acres. The HUC designations were not intended to determine specific details for smaller watersheds of tributaries which provide water quality and biotic functions of aquatic organisms for the overall watershed evaluations.

Table 1.1-1 – Descriptions of Hydrological Unit Codes (HUC).

Code	Official Name	General Description
HUC-2	REGION	Major land areas. The lower 48 states have 18 total, 1 additional each for Alaska, Hawaii, and the Caribbean. (21 total in US), called 1st Level – or Watershed 1st Level.
HUC-4	SUBREGION	Each Region has from 3 to 30 Subregions. The Missouri River Region has 30 Subregions. The lower 48 states have 204 (222 total in US), called 2nd Level.
HUC-6	BASIN	Accounting Unit (352 total in US), called 3rd Level.
HUC-8	SUBBASIN	Cataloging Unit. The smallest is 448,000 acres (700 square miles). Most are much larger. National HQ compilations have this as the smallest size unit (2,149 total in US), called 4th Level.
HUC-10	WATERSHED	Typically, from 40,000 to 25,000 acres (62 to 390 square miles). Work continues per new Interagency guidelines presented to Federal Geographic Data Committee on December 2000 (was formerly called HUC-11), called 5th Level or Watershed 5th Level.
HUC-12	SUBWATERSHED	Typically, from 10,000 to 40,000 acres (15 to 62 square miles). Work continues per new Interagency guidelines presented to Federal Geographic Data Committee on December 2000 (was formerly called HUC-14), called 6th Level or Watershed 6th Level.

1.2 Meaningful Watershed Delineation Sizes

In 2007, the U.S. Fish and Wildlife Service (USFWS) prepared a document, "Functional Assessment Approach for High Gradient Streams", for the U.S. Army Corps of Engineers to use in assessing impacts and mitigation with respect to processing Clean Water Act 404 permit applications. Upland high gradient headwater streams are characterized as first and second order ephemeral and intermittent streams with channel slopes ranging from 4% to greater than 10%, within watersheds of approximately 200 acres. The significance of this report relates to the proposed ACP gas pipeline construction with regard to how watersheds are evaluated. Because of the impacts of construction on the functions of headwater areas in the watersheds of upland first order high gradient streams, it is critical to evaluate these areas not simply as a small acreage within the area encompassing the construction project, but rather as functionally contributing areas which are the basis of water quality and aquatic habitat quality within the overall watershed.

In order to evaluate the interactions of precipitation, stormwater discharge, groundwater recharge and retention, and stream baseflow, calculations must be performed at the headwater tributary level. Because upland first order high gradient streams are well defined (Rosgen, 1994) and are considered to provide the basis for watershed evaluation (USFWS, 2007), it is essential to select these smaller watersheds, typically approximately 200 acres in size, to evaluate the impact of construction projects.

It is critical to delineate the areas of different ground covers within a watershed in order to accurately calculate stormwater discharge. In the Watershed Protection Research Monograph No. 1, prepared by the Center for Watershed Protection (2003), it is emphasized that the relationship between impervious cover and stream quality applies to watersheds of first order streams, second order streams, and third order streams. It is therefore extremely important to evaluate watersheds of the first order streams, second order streams, and third order streams impacted by proposed ACP construction in order to adequately determine the impacts of increased stormwater discharge due to an increase in impervious surfaces within a watershed rather than with just a portion of a watershed.

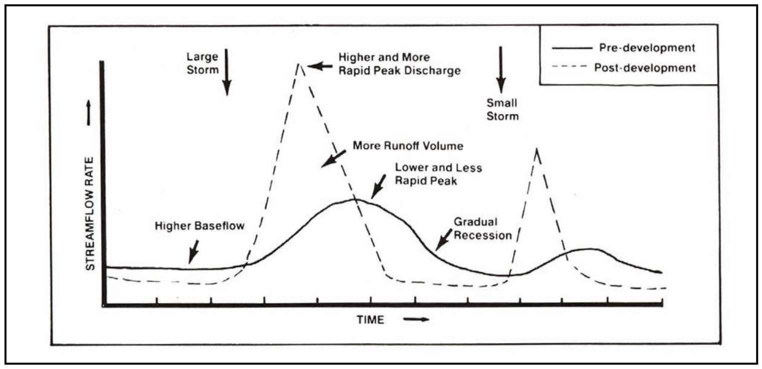
In Chapter 4 of the VDEQ Virginia Stormwater Management Handbook (2013), it is stated in section “4.5.1.5 Increased Imperviousness of the Land Surface” that:

“Impervious cover has emerged as a measurable, integrating concept used to describe the overall health or, conversely, degradation of a watershed. Research has established that when impervious cover in a watershed reaches between 10 and 25 percent …, ecological stress becomes apparent (Schueler et al., 2009). Beyond 25 percent impervious cover, stream stability is reduced, habitat is lost, water quality is degraded, and biological diversity is diminished.”

Additionally, in Chapter 4 of the VDEQ Virginia Stormwater Management Handbook (2013), it is stated in section “4.5.2. Stream Channel and Floodplain Impacts” that:

“Increased peak discharges for a developed watershed can be two to five times higher than those for an undisturbed watershed. As runoff velocities increase, it takes less time for water to run off the land and reach a stream or other water body (time of concentration). Streams in developed areas are often characterized as very "flashy" or “spiky” because of their response to these altered runoff characteristics. This characterization translates into the sharp peak and increased size of the post-development hydrograph as seen in Figure 4.21 [provided as **Figure 1.2-1** herein] below, which depict typical pre-development and post-development streamflow hydrographs for a developed watershed. The combination of greater volumes of runoff more often and at higher flow rates can create altered stream flows, localized flooding, stream channel degradation and property damage, even in small storm events.”

Figure 1.2-1 – Pre- and Post-Development Stormwater Runoff Hydrographs (this is Figure 4.21 excerpted from the DEQ Virginia Stormwater Management Handbook, 2013).



Also provided in Chapter 4 of the DEQ Virginia Stormwater Management Handbook (2013), it is the following summary:

"The impacts of altered stormwater runoff characteristics on stream channels and floodplains include the following:

- *Altered stream flow*
- *Channel erosion, widening and downcutting*
- *Increased frequency of bank-full and over-bank floods*
- *Floodplain expansion*

A comprehensive nationwide study by the United States Geological Survey (Carlisle et al., 2010) found that water flowing in streams and rivers has been significantly altered in nearly 90 percent of waters that were assessed... Flow alterations are considered to be the primary contributor to degraded river ecosystems and loss of native species. The USGS considers this assessment to provide the most geographically extensive analysis to date of stream flow alteration."

It is therefore critically important to recognize that where stormwater discharge is increased, due to an increase in less permeable surfaces, even without strictly impermeable surfaces, it is the increase of stormwater discharge to specific quantities that causes the damage to streams by downstream stream bank erosion. Watersheds must be evaluated for stormwater discharge from all the ground covers within the watershed in order to determine if the stormwater discharge is equal to or greater than the stormwater discharge that would result from a 10 percent impervious area within the watershed.

1.3 ACP Watershed Delineations are Deficient

Dominion Energy Transmission, Inc. (DETI) developed "Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Gas Transmission Facility Projects in Virginia" (DETI Standards and Specifications), dated June 2017, which pertain to the proposed Atlantic Coast Pipeline (ACP) construction project. It is stated in the DETI Standards and

Specifications that, “A complete stormwater management plan shall include the following elements: … 6. Hydrologic and hydraulic computations, including runoff characteristics; 7. Documentation and calculations verifying compliance with the water quality and quantity requirements of these regulations; 8. A map or maps of the site that depicts the topography of the site and includes: a. All contributing drainage areas… e. Sufficient information on adjoining parcels to assess the impacts of stormwater from the site on these parcels.” ACP has stated to the West Virginia Department of Environmental Quality (WVDEP) that peak stormwater discharge calculations are not necessary and has, therefore, not provided watershed delineations or peak stormwater discharge calculations. Appendix X of the ACP Site Specific Plans, provided to the Virginia Department of Environmental Quality (DEQ), includes the drainage areas delineated. However, ACP has not used a meaningful approach to delineating drainage areas.

The drainage areas delineated by Environmental Resources Management (ERM) for DETI are provided in the report, “Appendix X – Access Road and Right-of-Way Post-Construction Stormwater Management Evaluation Report, *Atlantic Coast Pipeline*”, dated June 12, 2017, for the stated intent of addressing “compliance of ACP with Virginia’s water quantity and quality criteria as set forth in 9VAC25-870-66 and 9VAC25-870-63, respectively, and related Virginia Department of Environmental Quality (VDEQ) guidance.” ERM delineated 170 drainage basins within the entire area in Virginia proposed for the ACP construction in Virginia. Similar maps have not been provided to the WVDEP for areas within West Virginia. The drainage basins used for water quantity calculations range from 36 acres to 84,092 acres. Only 20 of the drainage basin areas are less than or slightly greater than 200 acres, which is the typical size for meaningful stormwater discharge calculations. The larger delineated drainage basins extend far beyond the watershed of upland first order high gradient streams that will be impacted by ACP construction activities. Ground cover estimates and stormwater calculations for watersheds exceeding the area of the upland first order streams, second order streams, and third order streams *obscure the impacts to functions within the smaller watersheds*.

For example, **Figure 1.3-1** depicts the watershed of an unnamed tributary (UNT) to Lick Draft, within the George Washington National Forest, superimposed onto the map of the area provided by ACP in Appendix B of the ACP Final Environmental Impact Statement (FEIS). Lick Draft is a tributary to Townsend Draft. The watershed for the UNT to Lick Draft is approximately 72 acres, extending from approximately Mile Post (MP) 85.5 to approximately MP 86.0. The proposed ACP work corridor extends a length of approximately one-half mile, or 2640 feet, with an approximate width of 125 feet, which is approximately 7.57 acres. The VDEQ states in the Virginia Stormwater Management Handbook (2013) that construction activities in the work corridor would render it functionally impervious. The 7.57 acres of impervious area created by the proposed ACP work corridor and access roads constitutes approximately 10 percent of the watershed area, thereby causing degradation to the receiving stream (VDEQ Stormwater Management Handbook, 2013).

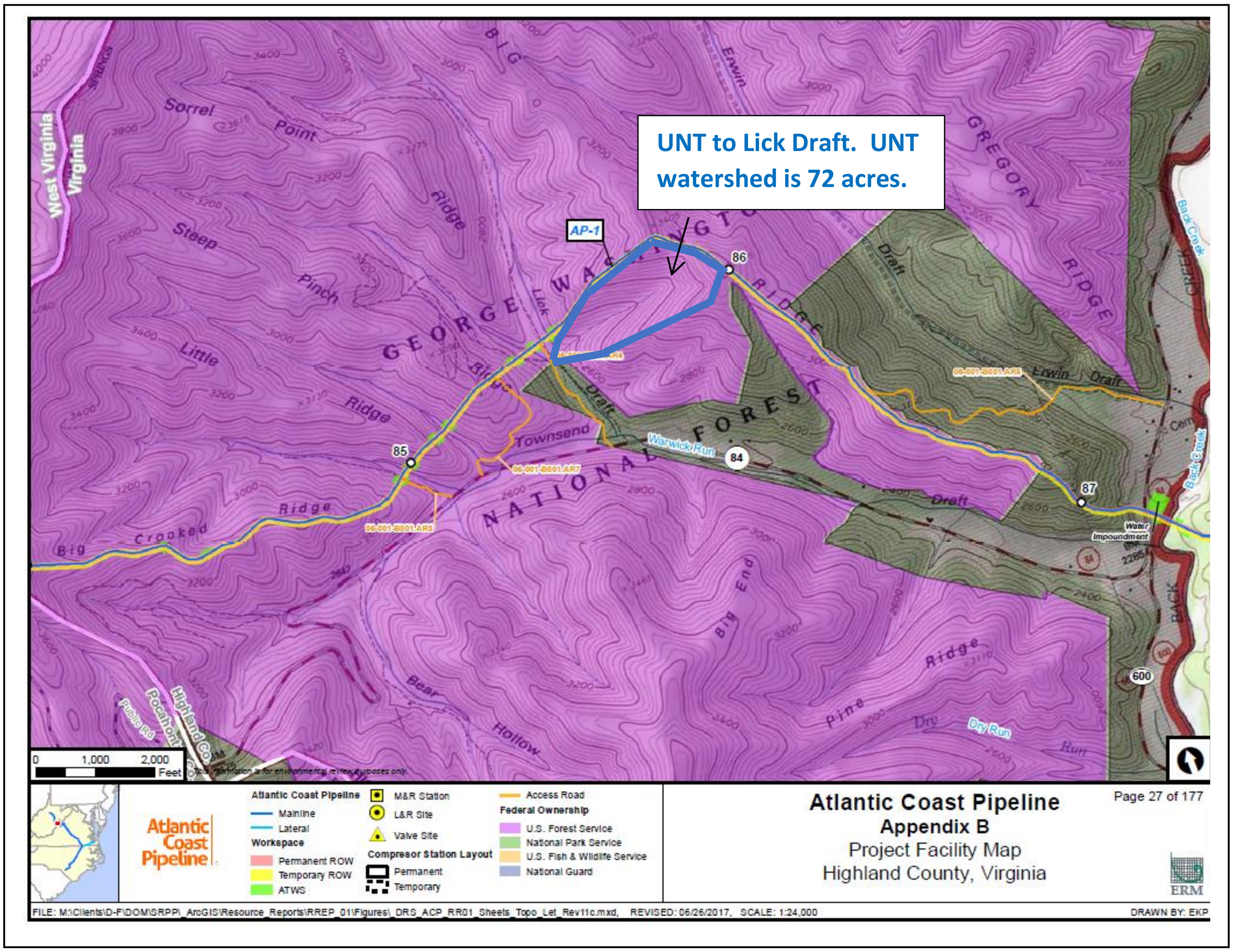


Figure 1.3-1 – Watershed delineation (outlined in blue) for UNT to Lick Draft. The UNT watershed is approximately 72 acres and is located in the George Washington National Forest. The watershed delineation is superimposed herein on the map provided in Appendix B of the ACP FEIS.

In ACP Appendix X, ERM provides delineated drainage basins for the proposed ACP construction area in Virginia. The watershed for the UNT to Lick Draft, depicted in **Figure 1.3-1**, is a small portion of ERM drainage basin 130, shown in **Figure 1.3-2**. The ERM drainage basin 130 is 32,890 acres, which is on the order of the HUC12 Subwatershed classification rather than the size of a watershed which should be used to conduct a functional assessment. ERM calculated stormwater discharge for the 32,890-acre drainage basin, using a “shrub land” category for the post-construction work corridor, even though such a construction area is considered by VDEQ to be *functionally impervious* (VDEQ Stormwater Management Handbook, 2013). Consequently, the stormwater discharge is based on ground covers that indicate the post-construction stormwater discharge is equal to the pre-construction stormwater discharge.

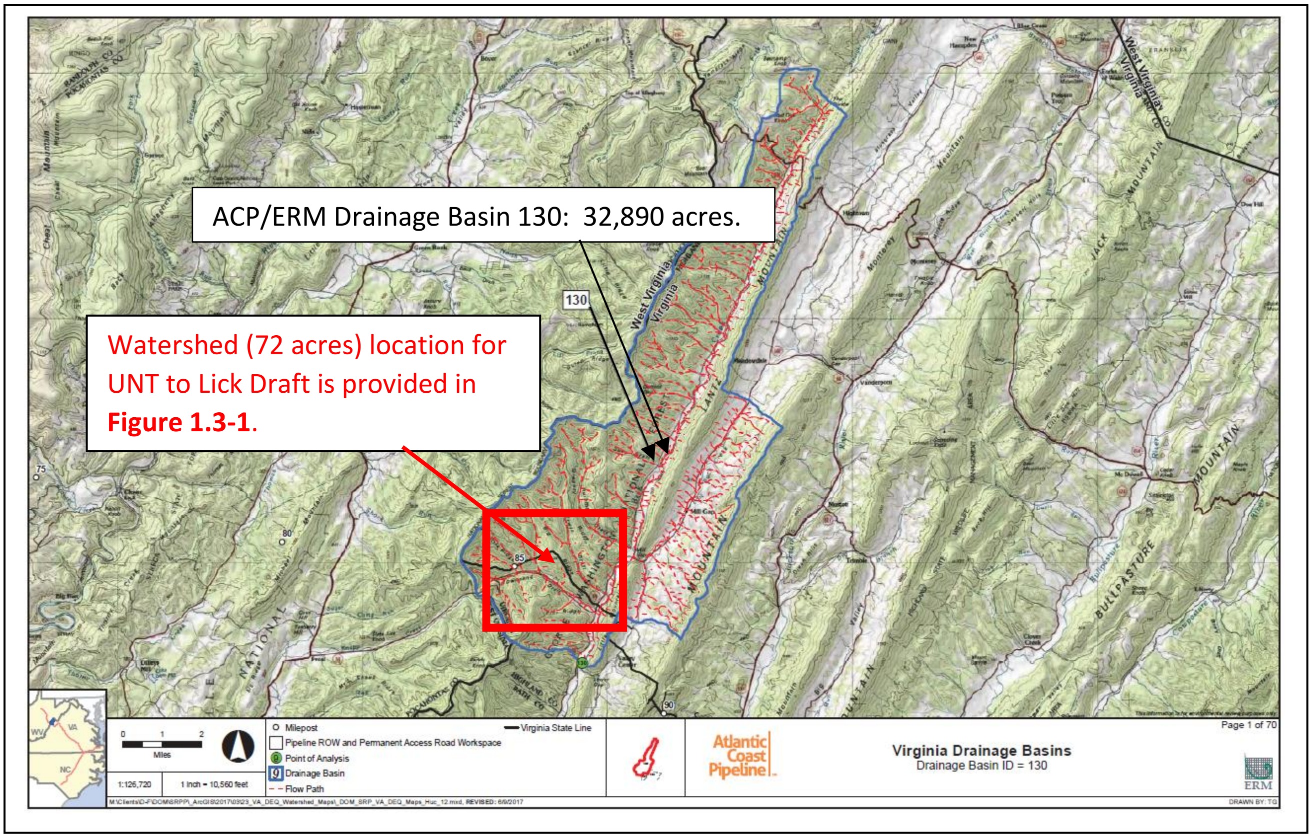


Figure 1.3-2 – Drainage basin 130 (outlined in blue), delineated by ERM as 32,890 acres. The area highlighted in the red rectangle includes the watershed of the UNT to Lick Draft, shown in **Figure 1.3-1**. This map is excerpted from ACP Appendix X, submitted to the Virginia Department of Environmental Quality.

Peak stormwater discharge calculations for drainage basins of 32,890 acres, such as used in the ERM calculations, do not conform to those of functionally significant watersheds of first order high gradient streams. Such calculations do not constitute the Best Available Scientific Information and are, therefore, **inconsistent with the 36 CFR 219 planning rule requirement §219.3: using the Best Available Scientific Information (BASI) to Inform the Planning Process.** Similarly, proposed ACP access roads are stated to be at least 30 feet wide for two-way traffic, where practical and constructed by grading and removing all organic material (including roots), with a 6-inch course of VDOT #1 Course Aggregate applied immediately after grading. The Virginia Erosion and Sediment Control Handbook specifies placing stone at an 8- to 10-inch depth where heavy vehicles are expected. This would certainly apply to the proposed ACP access roads. Typical road construction dictates compaction of the subgrade and the overlying stone, such that the access roads will be impervious.

1.4 ACP's Deficient Watershed Delineations Result in Inaccurate Stormwater Discharge Calculations

Of the drainage areas delineated by ERM for stormwater calculations provided in ACP Appendix X, 150 of the 170 delineated drainage areas exceed the acreages of functionally contributing areas which are the basis of water quality and aquatic habitat quality within the watershed. ERM calculated pre-construction and post-construction peak stormwater discharge calculations using the TR-55 method, which uses curve numbers to represent various ground covers. The Virginia Stormwater Management Handbook (2013) states that: “When soil is disturbed by grading, stockpiling, and heavy equipment traffic, the soil becomes compacted, structure is lost and porosity decreases. When this happens, the soil’s ability to take in water (permeability) is substantially reduced and surface runoff increases. Even if topsoil is stripped, stockpiled and reapplied following construction (a practice DEQ strongly recommends), the resultant loss of structure reduces the permeability of the topsoil. The loss of structure in the topsoil, together with compaction of the subsoil by construction equipment, is so profound that the bulk density of a lawn soil can approach that of concrete… The result is a surface that is *functionally impervious* because the soil’s permeability is so greatly reduced.” However, ERM states in ACP Appendix X that “all areas categorized as Forest within the pipeline permanent and temporary ROW will be converted to the Shrub land cover category.” In the Stormwater Pollution Prevention Plan (SWPPP) provided by ACP to the WV Department of Environmental Protection, it is stated that, “… post-construction runoff will remain essentially the same as preconstruction runoff. Therefore, the calculation of runoff coefficients for preconstruction versus post-construction conditions along the ROW is not warranted or applicable to the linear portion of the Project. Likewise, the pipe storage and contractor yards will be restored to preconstruction conditions and will not require stormwater management measures.” Consequently, ACP did not provide any peak stormwater discharge calculations to the WVDEP for proposed construction areas in West Virginia.

Appendix 2-B, “VSMP Permit Regulations” of the DEQ Virginia Stormwater Management Handbook (2013) provides the following definitions: 1) *"Runoff" or "stormwater runoff"* means that portion of precipitation that is discharged across the land surface or through conveyances to one or more waterways; 2) *"Runoff characteristics"* include maximum velocity, peak flow rate, volume, and flow duration; 3) *"Runoff volume"* means the volume of water that runs off the site from a prescribed design storm. Additionally, groundwater that has been diverted to the surface must be included in stormwater calculations: “**9VAC25-870-55. Stormwater management plans.**

A. A stormwater management plan shall be developed and submitted to the VSMP authority. The stormwater management plan shall be implemented as approved or modified by the VSMP authority and shall be developed in accordance with the following:

2. A stormwater management plan shall consider all sources of surface runoff and all sources of subsurface and groundwater flows converted to surface runoff…

6. Hydrologic and hydraulic computations, including runoff characteristics;

7. Documentation and calculations verifying compliance with the water quality and quantity requirements of these regulations;

8. A map or maps of the site that depicts the topography of the site and includes:

a. All contributing drainage areas.”

ACP did not provide stormwater discharge calculations to the WVDEP. For Virginia, ACP cannot provide accurate calculations of peak stormwater discharge in upland first order streams, second order streams, or third order streams because ERM did not delineate pertinent watersheds. The number of upland first order stream, second order stream, or third order watersheds that would be crossed by the 307 miles of proposed ACP construction in Virginia, including GWNF, is simply not provided because drainage areas delineated by ERM greatly exceed the sizes of the smaller watersheds which should have been delineated. Also, ACP has not embraced the description of *functionally impervious*, as described by the VDEQ for the proposed work corridor, but has used the "shrub land" curve number in post-construction peak stormwater discharge calculations.

In order to comply with "**Code of Virginia, Title 62.1. Waters of the State, Ports and Harbors, Chapter 3.1 State Water Control Law, Article 2.4 Erosion and Sediment Control Law § 62.1-44.15:52**", it is necessary to analyze the peak rate of runoff for a 24-hour storm event. A study of natural channels is presented in "Fluvial Processes in Geomorphology" (Leopold, L.B., M.G. Wolman, and J.P. Miller, 1964, W.H. Freeman, San Francisco) which concludes that natural stream channels are shaped by the 1½ frequency storm event. Furthermore, the U.S. Geological Survey has developed a bankfull discharge classification system for streams based on the premise that bankfull discharge in streams results from peak stormwater flow and determines the shape of the stream. Increased peak stormwater runoff discharge to receiving streams increases the bankfull discharge, which is the reason for the required analysis of peak rates of stormwater discharge stated in the Virginia Erosion and Sediment Control law. The intent of this is to detain stormwater runoff discharge from construction sites for a specified time period in order to control the peak stormwater discharge to the receiving stream. However, because of the increased impervious areas developed at large construction sites, the impact becomes more complicated. The Virginia Runoff Reduction Method defines impervious to include roadways and driveways as distinctly different from forested areas with respect to ground cover and stormwater runoff coefficients. However, ERM has used curve numbers weighted for drainage area sizes that far exceed the pertinent watershed sizes of first order streams, second order streams, or third order streams and used a curve number for "Shrub land" for post-construction work corridor construction areas. At best, even though this area is considered as *functionally impervious* by the VDEQ, the post-construction areas would be better ascribed curve numbers for "managed turf" because there will not be re-forestation and there will be no tree canopy to intercept precipitation such that it will fall gently to the ground. In all of the ERM calculations for peak stormwater discharge, the weighted curve number values for pre-construction ground cover are the same or less than the post-construction weighted curve numbers. This would indicate no change in ground cover before and after construction, or an improvement in ground cover after construction.

In the publication, "Technical Bulletin No. 1 – Stream Channel Erosion Control (1999, http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/TechBulletin1.pdf), the Virginia Department of Conservation and Recreation explains that deforestation and soil compaction at large construction sites not only increase the amount of stormwater discharge to receiving streams, but also increase the frequency of peak runoff rate because the increased amount of impervious areas results in less infiltration. As a consequence, “it takes less rainfall to produce the same *volume* of runoff. Therefore, the *peak rate of runoff* that normally occurs on a 2-year frequency before development, may occur several times a year following development.” (VDCR, 1999).

ERM simply does not provide peak stormwater discharge calculations required to determine the peak stormwater runoff for watersheds of upland first order streams, second order streams, or third order streams. Only the peak stormwater discharge from the actual watershed can provide a basis to determine the increased stream bank erosion downstream. Increased peak stormwater discharge from construction activities will result in increased sedimentation in streams 1) directly, because BMPs are not 100 percent effective in preventing sediment transport to streams; and 2) indirectly, because peak stormwater discharge will cause stream bed scour and stream bank erosion downstream, resulting in the introduction of turbidity and sediment to the streams. The increased turbidity and sedimentation will 1) degrade water quality, which is **inconsistent with Code of Virginia, Title 62.1**. **Waters of the State, Ports and Harbors” under “§62.1-11. Waters declared natural resource; state regulation and conservation; limitations upon right to use**; and will 2) increase embeddedness in the stream beds, degrading or destroying aquatic habitats, which is inconsistent with **Code of Virginia, Title 62.1. Waters of the State, Ports and Harbors, Chapter 3.1 State Water Control Law, Article 2.4 Erosion and Sediment Control Law § 62.1-44.15:52;** the **Virginia Water Protection Permit (§ 62.1-44.15:20);** and **9VAC25-260-20 (Water Quality Standards), which explains that turbidity is a substance to be controlled because it can be harmful to aquatic life.**

Determination of accurate water quantities, evaluated by determination of peak stormwater discharge, is required by Virginia Administrative Code “**9VAC25-870-66. Water quantity.**
B.1. Manmade stormwater conveyance systems. When stormwater from a development is discharged to a manmade stormwater conveyance system, following the land-disturbing activity, either:
a. The manmade stormwater conveyance system shall convey the post-development peak flow rate from the two-year 24-hour storm event without causing erosion of the system. Detention of stormwater or downstream improvements may be incorporated into the approved land-disturbing activity to meet this criterion, at the discretion of the VSMP authority; or
b. The peak discharge requirements for concentrated stormwater flow to natural stormwater conveyance systems in subdivision 3 of this subsection shall be met.”

Clearly, peak stormwater discharge from an upland first order stream, second order stream, or third order stream cannot be calculated 1) if the stream’s watershed is not accurately delineated; 2) if the various ground covers are not accurately delineated; and 3) if there is no consideration of the additional amount of surface runoff due to the

groundwater flow diversion from trench dewatering and from seeps and springs intercepted during hill slope excavation for the ACP construction activities.
ERM also provided calculations for sizing culverts and ditches. Again, the calculations indicate no change in the post-construction stormwater discharge from the pre-construction stormwater discharge because of the misrepresentative ground cover curve numbers used in the equations. The drainage areas are appropriate for sizing culverts and ditches. However, there are no sizing calculations for other BMPs, specifically, the limit of one-quarter acre per 100 feet of silt fence length, 1 acre for a drainage area to silt fence in minor swales or ditch lines and flow no greater than 1 cubic feet per second, or 5 acres for sizing temporary diversion dikes. BMPs shown on the construction plan sheets consist of silt fence, compost filter socks, and diversion berms. It should be noted that there are no sediment basins shown on the construction plans, even though Virginia law **§62.1-44.15:28.A.10** requires that stormwater management practices must be "designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm…". Sediment basins constitute the only BMP which can provide the mandatory water detention.

1.5 Proposed ACP Construction Would Result in Adverse Impacts to Watershed Functions

Forested ridges intercept rainfall so that it gently penetrates the ground as groundwater rather than flowing overland as runoff. This means that 1) the rain will gently fall to the ground and recharge groundwater and 2) the surface flow of rainwater on the ground will be slower than in cleared areas, thereby reducing the velocity and quantity of stormwater drainage. Conversely, deforestation removes the protective tree canopy, causing increased stormwater discharge and decreased groundwater recharge. The proposed ACP construction would result in deforestation, dewatering, and soil compaction, causing increased stormwater discharge and decreased groundwater recharge. **Figure 1.5-1** provides an illustration of a typical pipeline installation work corridor. Leveling of the work corridor and access roads, along with trenching for pipe installation within a deforested 125-foot wide corridor, will intercept groundwater, thereby reducing or eliminating the flow of water to rock fractures which serve as a conduit to provide water to seeps, springs, and wetlands, as well as to streams during times of drought. It is further stated that additional acreage is required for proposed additional temporary workspaces, pipe yards, staging areas, access roads, and construction associated with aboveground facilities. These additional areas will also increase stormwater discharge and reduce groundwater recharge.

Figure 1.5-1 – Leveled work corridor for pipeline installation, showing cut hillsides and dewatering. Heavy equipment and truck traffic, along with soil stockpiles, will compact soils.

Where ACP construction is proposed on ridges and slopes, deforestation and leveling of the work corridor and access roads, along with trenching for pipe installation, will intercept groundwater, thereby reducing or eliminating the flow of water along perched aquifers or to rock fractures. Groundwater flows downgradient, providing water to seeps, springs, and wetlands, as well as to streams during times of drought. It is stated in Section “2.3.3.5 STEEP SLOPES” of the ACP FEIS that, “Any springs or seeps found in the upslope cut would be carried downslope through polyvinyl chloride pipe and/or gravel French drains during restoration.”

Groundwater recharge occurs in upland areas such that the groundwater table is elevated and a hydraulic gradient develops, forcing the groundwater downgradient. In the Valley and Ridge Physiographic Province, rainfall is greatest in the upland areas because warm air masses cool in the higher elevations, causing condensation and precipitation. Groundwater moves through the soil to bedrock planes and fractures, where the water flows along these paths to intercept the ground surface, forming seeps and springs which facilitate moisture in headwater area aquatic habitats and wetlands. Groundwater also moves downgradient to provide baseflow to streams in times of drought. It is stated in the Virginia Stormwater Management Handbook (2013): “Perennial streams receive continuous baseflow from this groundwater discharge, during both wet and dry periods. Much of the time, all of the natural flow in a stream is from groundwater discharge. In this sense, groundwater discharge can be seen as the “life” of streams, supporting all water-dependent uses and aquatic habitat.”

As shown in **Figure 1.5-1**, hills or ridges that are encountered in the proposed ACP construction zones will be leveled, indicating that such areas will be excavated several feet, potentially below the soil level, such that no root biomass is contained within those specific excavated areas.

Figure 1.5-2 provides a schematic diagram showing ridgetop removal to create a level work corridor surface for pipeline construction activities. The schematic diagram is excerpted from Appendix O of the ACP Stormwater Pollution Prevention Plan (SWPPP), submitted August 25, 2017 by ACP to the WV Department of Environmental Protection. Where elevated areas are present in the work corridor or access road areas, excavation and/or blasting will remove the elevated area to be leveled within the proposed construction areas. The complete soil horizon will be removed, potentially to depths that will eliminate any root mass.

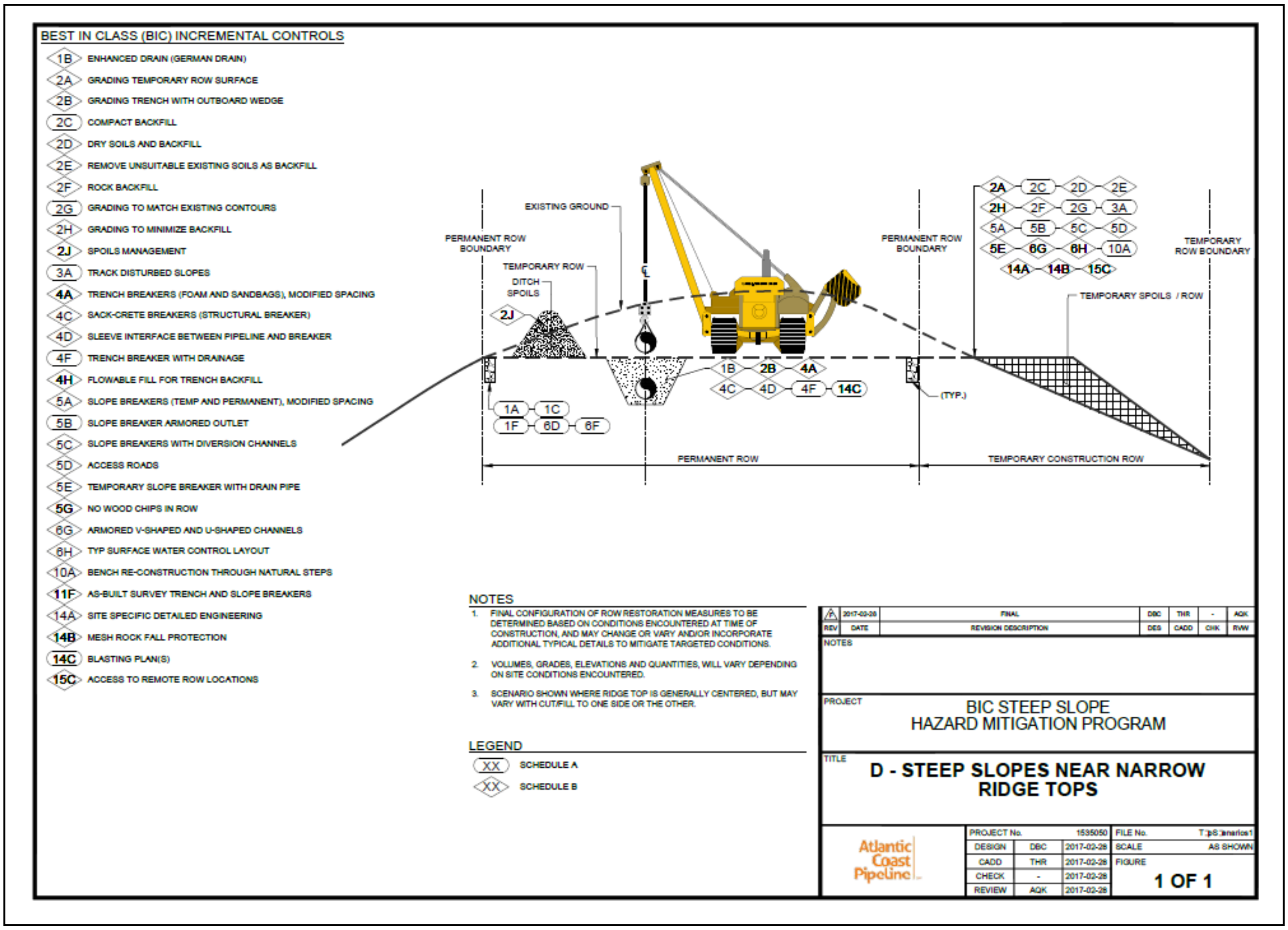


Figure 1.5-2 – ACP typical section demonstrating removal of elevated areas along the proposed ACP construction areas to create level work areas. This schematic diagram is excerpted from the ACP SWPPP submitted to the WVDEP.

Figure 1.5-3 is excerpted from ACP typical construction diagrams, showing the procedure for side slope construction. Water from seeps and springs encountered during this procedure will be directed onto the ground surface.

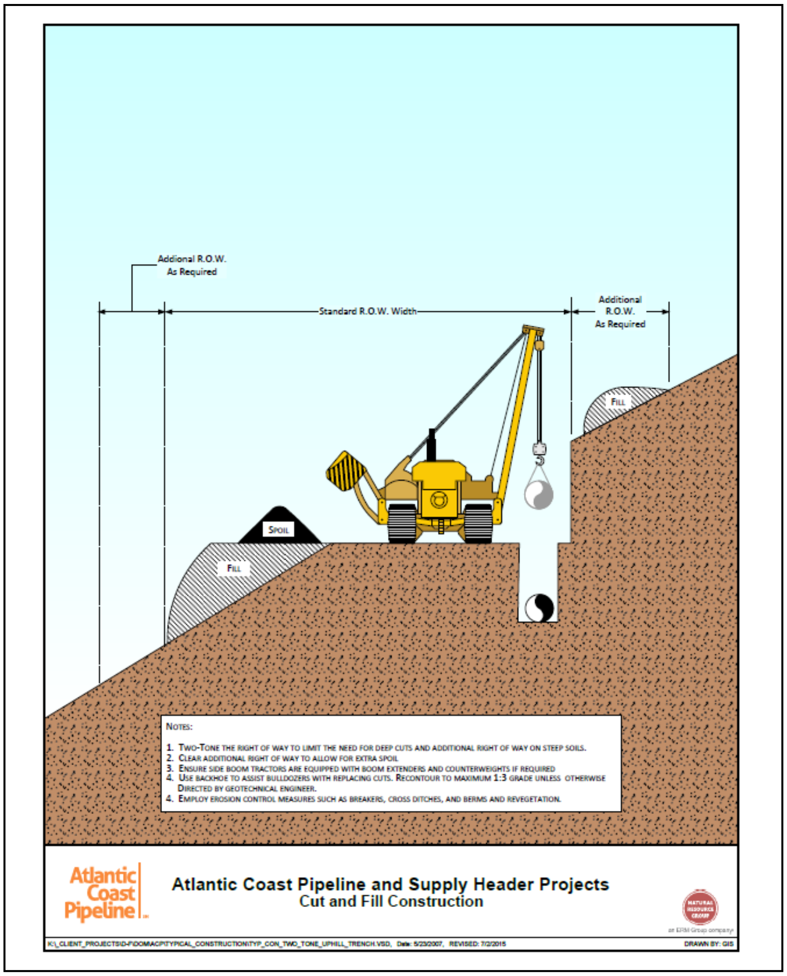


Figure 1.5-3 – ACP typical section demonstrating removal of elevated side slope areas along the proposed ACP construction areas to create level work areas.

2.0 PROPOSED ACP CONSTRUCTION IMPACTS TO AQUATIC HABITATS

The proposed ACP construction activities will cause decreased groundwater discharge and increased light and temperatures, due to deforestation, in headwater areas of first order streams. Filtered light and lower temperatures in headwater areas are required to sustain aquatic habitats for aquatic macroinvertebrates at the base of the food chain. This is **inconsistent with Code of Virginia, Title 62.1. Waters of the State, Ports and Harbors" under "§ 62.1-11**. Waters declared natural resource; state regulation and conservation; limitations upon right to use, F. The quality of state waters is affected by the quantity of water and it is the intent of the Commonwealth, to the extent practicable, to maintain flow conditions to protect instream beneficial uses and public water supplies for human consumption. **9VAC25-260-20** (Water Quality Standards) includes limits on increases in stream temperatures.

2.1 Consequences of Deforestation

As depicted in **Figure 2.1-1**, when rainwater is intercepted by trees on forested ridges, the rainfall gently penetrates the ground surface and migrates downward through the soil to bedrock. The water then flows along perched aquifers or through bedrock fractures and along bedding planes to continue migrating downward or to form seeps and springs where the fractures or bedding planes intercept the ground surface. Seeps and springs can occur at various elevations on mountain slopes, depending on the presence of perched aquifers and also where the bedrock fractures or bedding planes intercept the ground surface. Seeps and springs also occur along streams and rivers. As the quantity of groundwater accumulates beneath the ground surface, a hydraulic gradient forms, causing the groundwater to move downgradient to nearby streams and rivers or to lower areas where the water may reach streams and rivers that are farther away.

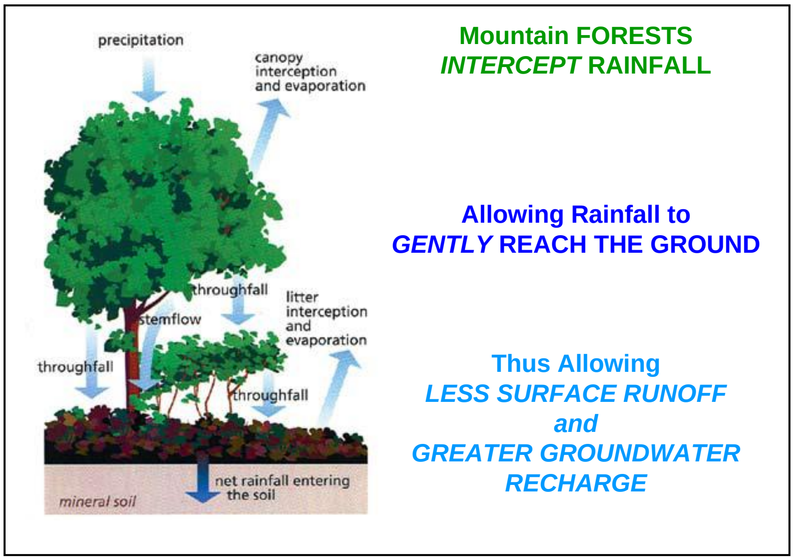


Figure 2.1-1 – Forested areas facilitate groundwater recharge and reduced stormwater runoff.

Headwater areas of first order streams provide the essential aquatic habitats for aquatic species and associated terrestrial fauna and fowl within the entire length of the river continuum in the overall watershed. The soils which have formed in the headwater areas regulate the transport of surface water and also carbon, nitrogen, and oxygen. The shade of the forest canopy provides the filtered light and lower temperatures critical to maintaining the headwater aquatic habitats.

2.2 The River Continuum

The River Continuum Concept was developed by Vannote, R.L., G. W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing in 1980 and presented in the Canadian Journal of Fisheries and Aquatic Sciences 37: 130-137. The U.S. Environmental Protection Agency and the U.S. Department of Agriculture have embraced the River Continuum Concept as illustrating the strong connection between headwater areas on mountain ridges and various downstream areas. The River Continuum Concept diagram (**Figure 2.2-1**) provides pie diagrams of predominant benthic aquatic organisms associated with various locations, starting at the headwaters, along the river continuum. Shredders, predominant in the forested headwaters, break down organic matter used downstream by collectors, predators, and filter-feeders. The filter-feeders are subsequently consumed by larger benthos and fish.

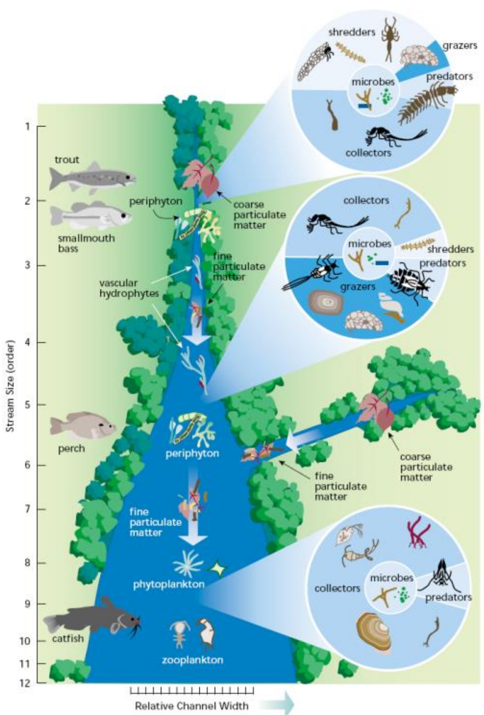


Figure 2.2-1 – The River Continuum (Vannote, et al; 1980) illustrates the food chain connection between headwater areas of first order high gradient streams and the wider, larger downstream areas in the overall watershed.

Ecological communities are typically classified with respect to the vegetation present because it is the most permanent, visible feature of a community. Biodiversity refers to the diversity within an ecological community, with emphasis on the inter-relationships and interdependence among the various species. Trees not only intercept rainfall so that it falls gently to the ground surface and is thus able to penetrate the ground as groundwater recharge, but also store nutrients in their trunks, branches, and roots. Fungi in the soil facilitate transport of nutrients between trees and the soil. The soil stores nutrients which are processed by soil microbes to regulate essential nutrient cycles involving oxygen, carbon dioxide, nitrogen. Roots of the trees and of herbal vegetation help to stabilize the soil so that the soil nutrients are not washed away by stormwater runoff. The ecological communities in the headwater areas of upland first order high gradient streams consist not only of the vegetation, but also the aquatic benthic macroinvertebrates, fungi, and soil microbes. Insect larvae, commonly grouped as shredders, constitute most of the aquatic benthic macroinvertebrates in the headwater areas because they shred organic material into components used by collectors and predators downstream.

2.3 Construction Impacts on Watersheds within FS Lands

The proposed FS Plan amendments would result in degradation of headwater areas of first order high gradient streams and cumulative degradation of areas within FS lands, including 1) streams in Pocahontas County, West Virginia: Slaty Fork, Warwick Run, Clover Creek, Glade Run, Sugar Camp Run, Knapp Creek, Shock Run; 2) streams in Highland County, Virginia: Townsend Draft, Lick Draft, Erwin Draft; 3) streams in Bath County, Virginia: Laurel Run, Dry Run, Campbell Run, UNTs to the Cowpasture River, UNTs to Gibson Hollow, Mill Creek; 4) streams in Augusta County: Barn Lick Branch, Calfpasture River, Dowells Draft, East Branch Dowells Draft, White Oak Draft, UNT to Moffett Creek, UNTs to Jennings Branch, UNTs to Back Creek, UNTs to South Fork Back Creek, UNTs to Pond Hollow.

The ACP Wetland and Waterbody Delineation Report (ACP Waterbody Report), prepared by ERM, was provided as Appendix B of the Individual 401 Water Quality Certification Supplemental Information document, dated August 2016, submitted to the West Virginia Department of Environmental Protection (WVDEP). The coordinates were provided in the ACP Waterbody Report for streams, wetlands, and seeps identified by ACP contractors.

2.3.1 Construction Impacts to Slaty Fork, Pocahontas County, WV

Headwater areas of Slaty Fork are located between MP 71 and MP 73 in Pocahontas County, WV. In the Stormwater Pollution Prevention Plan (SWPPP) for the proposed ACP construction, submitted by Dominion Energy Transmission, Inc. (DETI) on August 25, 2017 to the West Virginia Department of Environmental Protection (WVDEP), it is stated that, “The only Tier 3 waterbody associated with the Project in West Virginia is Slaty Fork which is crossed by an access road (ID AR#05-001-C009.AR1) near its headwaters. No impacts are anticipated to Slaty Fork as a result of the access road.” However, the access road will be as much as 30 feet wide and will be constructed as functionally impervious. Also, where the proposed access road is located, ACP contractors have documented and reported numerous seeps, wetlands, intermittent streams, and ephemeral streams in the headwater areas of Slaty Fork. **Figure 2.3.1-1** is a map depicting areas impacted by the proposed ACP construction between MP 71 and MP 72. Deforestation will cause increased stormwater discharge to Slaty Fork, causing downstream stream bank erosion, thereby increasing turbidity and sedimentation in Slaty Fork. The increased turbidity and sedimentation will reduce water quality in Slaty Fork, which is a Tier 3 stream.

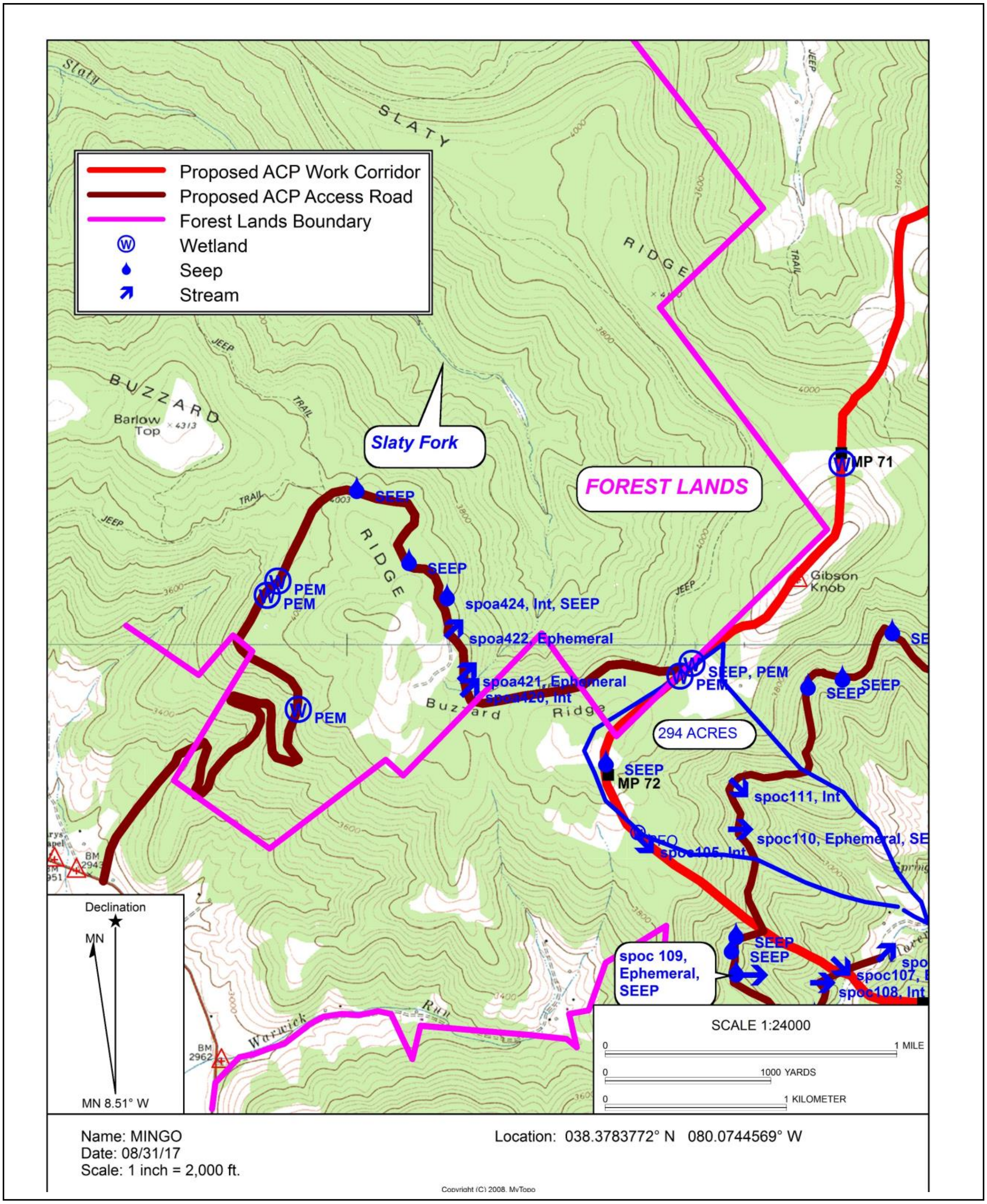


Figure 2.3.1-1 – Topographic map of proposed ACP construction areas between MP 71 and MP 72. Headwater streams, wetlands, and seeps for Slaty Fork will be impacted by the proposed ACP construction. Map developed by P.C. Dodds using Terrain Navigator Pro mapping software.

The proposed ACP access road construction extends along the side slopes of Buzzard Ridge within the Monongahela National Forest. The documented seeps and wetlands facilitate aquatic habitats for aquatic species at the base of the food chain in the river continuum in the uppermost segment of Slaty Fork. Groundwater maintains the seeps and wetlands. The documented intermittent streams are maintained by groundwater as well as precipitation. The ephemeral streams provide transport of precipitation to the headwater areas and to Slaty Fork. Groundwater maintains baseflow of water in Slaty Fork during times of drought. In the ACP SWPPP, it is stated under "9.5.2 Seeps" that, "In the event that subsurface flow is encountered, a subsurface drain or under drain will be utilized, as necessary, to divert water outside of the LOD. If encountered, seeps can be mitigated by using seep collectors placed down-slope of areas showing seepage. Armored fill placed at the toe of the slope may be used in areas of steep slopes in addition to a perforated drain pipe to divert subsurface water away from the cut slope." This construction activity, therefore, will provide permanent conduits to deprive the headwater areas of Slaty Fork from receiving groundwater to maintain headwater aquatic habitats.

The proposed ACP work corridor for trenching, soil stockpiling, and pipe installation activities is located along Buzzards Ridge, which is the drainage divide for the Slaty Fork watershed. Wetlands and seeps, documented by ACP contractors, are located in the proposed ACP work corridor. In addition to seep collectors and pipes installed to divert the subsurface water away from the work corridor, ACP stated in the WVDEP SWPPP that periodic dewatering will, "remove accumulated water or precipitation from the construction ROW, including from within the trenchline." Water from such dewatering activities is then to be "discharged into areas where adequate vegetation is present adjacent to the construction ROW to function as a filter medium." This would constitute concentrated flow of water into the vegetated areas, which would result in erosion.

Soils within the proposed ACP work corridor between MP 71 and MP 72 are documented by ACP as Cateache soils and Mandy soils. Cateache soils consist of extremely acid to very strongly acid channery silt loam developed on residuum weathered mainly from red interbedded siltstone and shale of the Mauch Chunk Group and Maccrady Formation. Depth to bedrock is 20 to 40 inches for Cateache soils. Mandy soils consist of extremely acid to very strongly acid channery silt loam developed on residuum and/or creep deposits (colluvium) weathered from interbedded shale, siltstone, and fine-grained sandstone. Depth to bedrock is 20 to 40 inches for Mandy soils. Colluvium is indicative of continual landslide activity.

Deforestation (resulting in greater stormwater runoff and reduced groundwater recharge), soil compaction, and trench dewatering as well as side slope seep dewatering will lower the groundwater table and reduce the amount groundwater to maintain aquatic habitats in the headwater areas of Slaty Fork, a Tier 3 stream. The presence of creep (colluvium) deposits on the hill slopes indicate soil landslide activity, which will facilitate movement of sediments toward Slaty Fork.

Blasting may be necessary because bedrock is 20 to 40 inches from the ground surface. Blasting will cause changes in the quantity and flow direction of groundwater. Such changes in groundwater, along with reduced groundwater recharge, will reduce the hydraulic head, causing permanent changes in groundwater movement downgradient. Impacts will result by reducing groundwater availability to maintain aquatic habitats in the headwater areas of Slaty Fork and also reducing groundwater baseflow to Slaty Fork during times of drought.

Construction of the proposed ACP project is **not consistent with** the substantive requirement of the FS planning rule **§219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. Because there is construction in multiple headwater areas to specific streams, the adverse impact is cumulative. Construction of the proposed ACP project is **not consistent with** FS planning rule **36CFR 219.8(a)(2)(iv)** because of detrimental changes to groundwater quantities and detrimental changes to stream water quality due to increased turbidity and sedimentation. Construction of the proposed ACP project is **not consistent with §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

2.3.2 Construction Impacts to Clover Creek, Pocahontas County, WV

Headwater areas of Clover Creek, Pocahontas County, WV, are located between approximately proposed ACP MP 72 and approximately MP 73.7. **Figure 2.3.2-1** provides the location of Clover Creek, showing portions of the proposed ACP work corridor within the Monongahela National Forest. Watersheds of two first order unnamed tributary streams (UNTs) to Clover Creek have been delineated on the topographic map to illustrate the cumulative impacts to Clover Creek. Deforestation and soil compaction within the proposed ACP work corridor and the proposed access road will result in increased stormwater discharge to Clover Creek, which will result in downstream stream bank erosion along Clover Creek. The increased stream bank erosion will result in increased turbidity and sedimentation in Clover Creek, causing decreased water quality, which is **inconsistent with FS planning rule §219.8(a)(2)(ii)**.

Seeps and wetlands, documented by ACP, are located on the topographic map. The seeps and wetlands maintain aquatic habitats in the headwater areas of Clover Creek. Seep dewatering activities and trench dewatering activities will divert groundwater from the aquatic habitats and will increase surface water runoff toward Clover Creek, which is **inconsistent with FS planning rule 36CFR 219.8(a)(2)(iv)**. Degradation of these headwater aquatic habitats will impact aquatic species at the base of the river continuum food chain. Deforestation of the proposed ACP work corridor and access road will also increase stormwater discharge to Clover Creek, causing increased stream bank erosion that will increase turbidity and sedimentation in Clover Creek, causing decreased water quality, which is **inconsistent with FS planning rule §219.8(a)(3)(i)**.

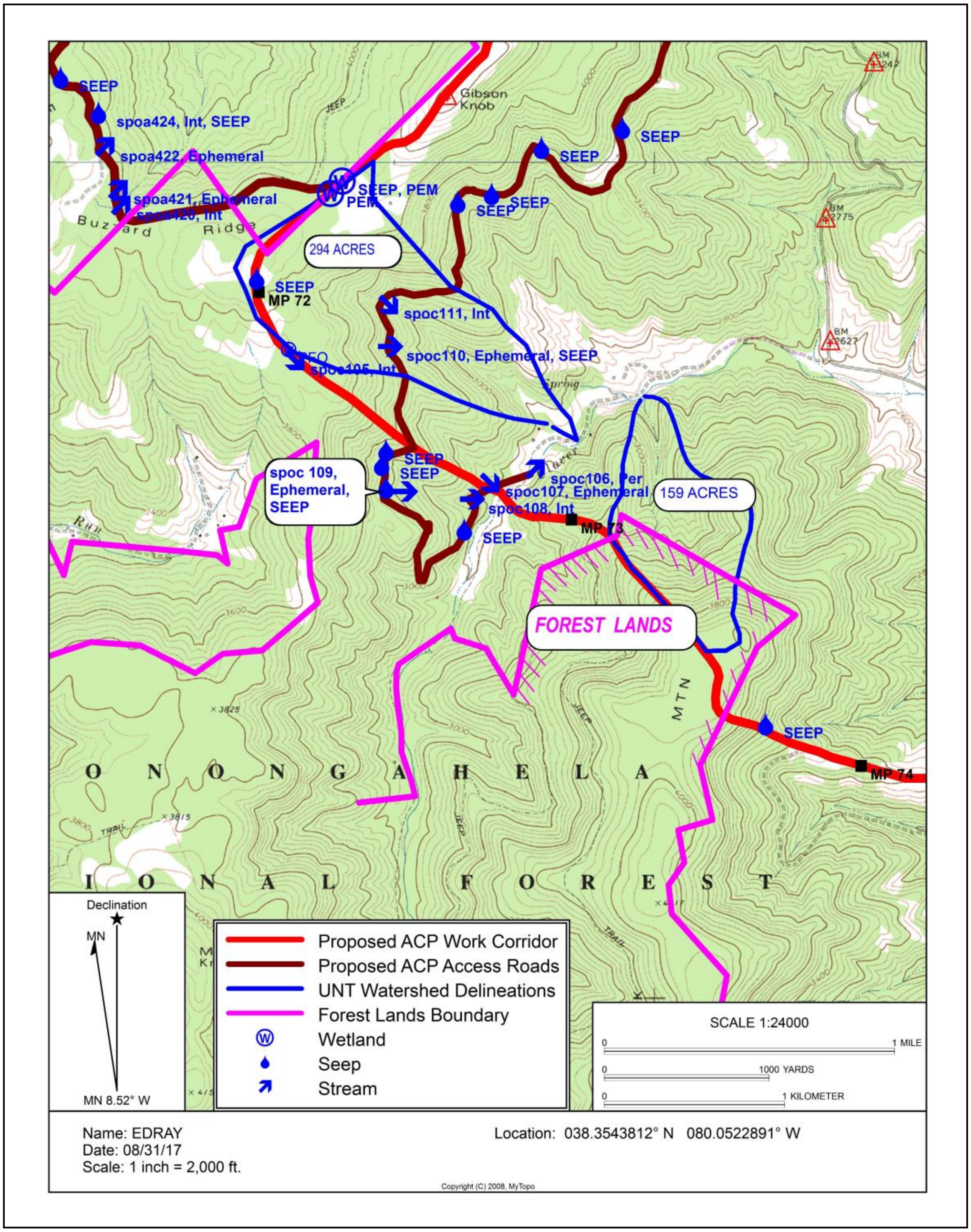


Figure 2.3.2-1 – Topographic map of headwater areas for Clover Creek. Watershed delineations of 2 UNTs to Clover Creek illustrate the cumulative impacts to headwater areas from the proposed ACP project. Map developed by P.C. Dodds using Terrain Navigator Pro mapping software.

2.3.3 Construction Impacts to Dowells Draft and East Branch Dowells Branch, Augusta County, VA

Dowells Branch and East Branch Dowells Draft, Augusta County, VA, are located between approximately ACP MP 117 and MP 118.1. **Figure 2.3.3-1** illustrates that these two streams unite at a point as tributaries within the upper reaches of the Calfpasture River. The Calfpasture River is documented by the Virginia Department of Game and Inland Fisheries as a wild brook trout stream. Appendix K of the ACP FEIS provides that the proposed ACP work corridor (as much as 125 feet wide) and associated proposed ACP access roads (as much as 30 feet wide) within the George Washington National Forest would extend 1) 10 feet across the perennial Dowells Draft, with Virginia Regulatory Classification as Aquatic Life, I-IV, at MP 117.1; 2) 9 feet across an intermittent UNT to Dowell's Draft, with Virginia Regulatory Classification of Aquatic Life, I-IV, at MP 117.2; 3) 10 feet across perennial East Branch Dowells Draft, with Virginia Regulatory Classification of Aquatic Life, I-IV, at MP 117.3; and 4) 7 feet across intermittent East Branch Dowells Draft, with Virginia Regulatory Classification of Aquatic Life, I-IV, at MP 117.7. In-stream blasting is specified by ACP at 3 of the 4 proposed crossings. The dam and pump or flume methods are proposed for 3 of the 4 crossings. The method for crossing the remaining stream is not specified. "Pre-construction aquatic species relocation" is specified for the crossings where blasting will be conducted.

It is stated in the ACP FEIS that "*Dry crossing methods involve the installation of a flume pipe(s) and/or dam and pump prior to trenching to divert the stream flow around the construction area and allow trenching of the stream crossing in drier conditions, isolated from the stream flow… The impacts of the dry crossing methods on fishery resources could include:*

- *increased sedimentation and water turbidity immediately downstream of the construction work area;*
- *direct contact with relatively immobile prey organisms (e.g., benthic and epibenthic) that may be food resources for fish;*
- *alteration or removal of aquatic habitat cover;*
- *introduction of pollutants through possibly contaminated bottom sediments or spills of*
  fuels or lubricants;
- *impingement or entrainment of fish and other biota associated with the use of water pumps at dam and pump crossings; and*
- *downstream scour associated with use of pumps or flume discharge.*

In addition, removal of streamside vegetation at the crossings may reduce shading of the waterbody, diminish escape cover, and could, in small areas where flow is minimal or constrained, result in locally elevated water temperatures."

Crossings of Dowells Draft, East Branch Dowells Draft, and the associated UNTs would result in a total disconnection of the ecological functions within the river continuum. Increased turbidity and sedimentation from the crossings would increase embeddedness downstream, compromising aquatic habitats for juvenile trout.

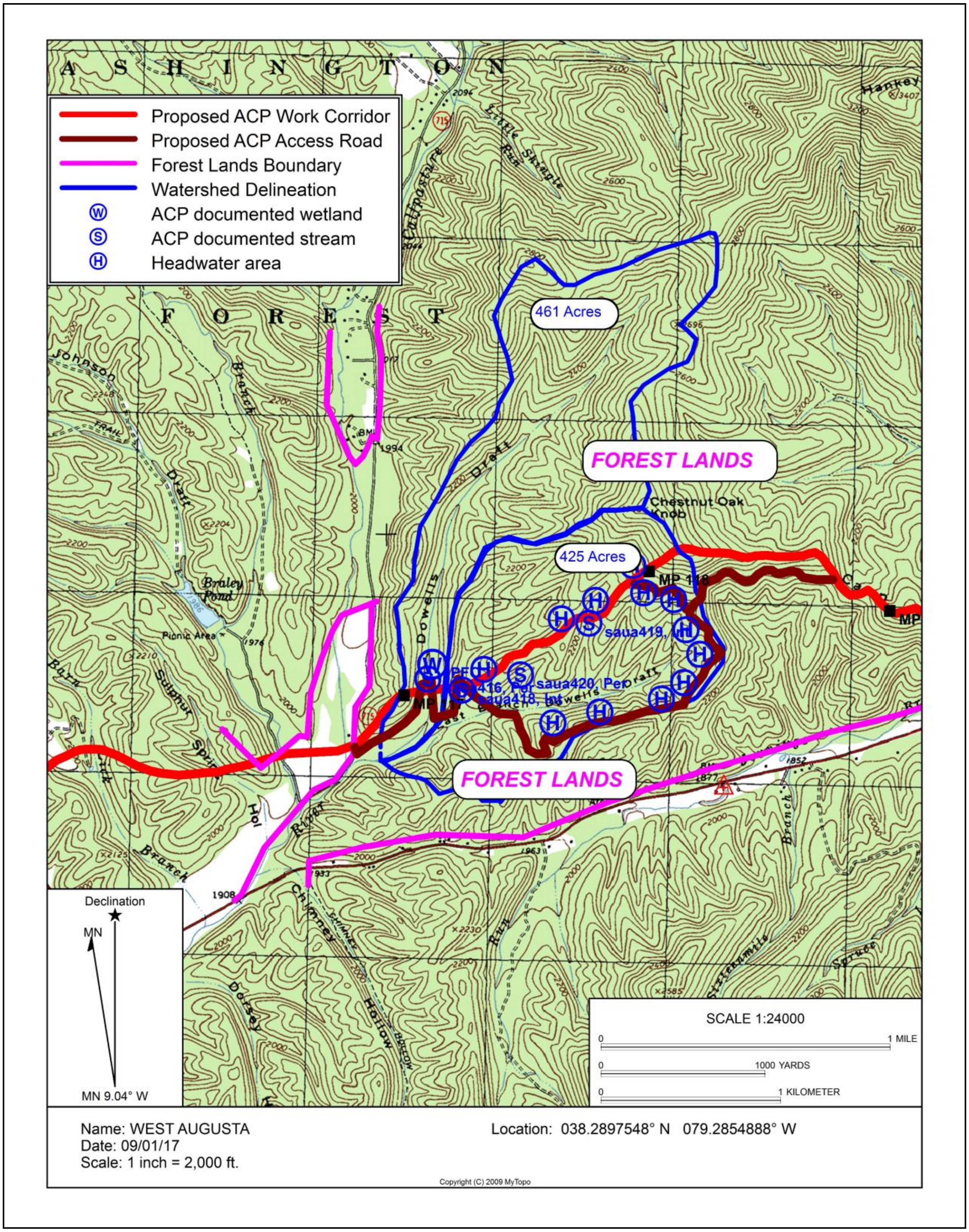


Figure 2.3.3-1 – Topographic map of proposed ACP work corridor and access roads in watersheds of Dowells Draft and East Branch Dowells Draft, illustrating cumulative impacts to streams crossed and to headwater areas. Map developed by P.C. Dodds using Terrain Navigator Pro mapping software.

Increased turbidity and removal of streamside vegetation (reduced shading) will allow increased water temperatures in trout waters, which would be detrimental to trout. It is explained in the ACP FEIS that, “The effects of blasting on aquatic biota varies by species…, but generally relatively small organisms and those close to the blast or near the sediment surface experience higher mortality… Non-lethal effects may include eye distension, hemorrhage, hematuria, and damage to bodily systems…”. As explained in the ACP COM, blasting protocols for stream segments near the blasting include alerting fish to move away from the blasting area by using a blasting cap in the stream. This presumes that fish would understand which direction to use as an escape route. If fish are physically moved, it is understood that handling of fish frequently results in fish mortality.

The proposed ACP work corridor and two proposed ACP access roads would traverse the entire length of the East Branch Dowells Draft watershed through numerous headwater areas and through intermittent streams (defined as having connection with groundwater) documented by ACP. Deforestation and soil compaction within the proposed ACP work corridor and the proposed access road will result in increased stormwater discharge to the Calfpasture River, which will result in downstream stream bank erosion along East Branch Dowells Draft and the Calfpasture River. The increased stream bank erosion will result in increased turbidity and sedimentation in Dowells Draft, East Branch Dowells Draft, and the Calfpasture River, causing decreased water quality.

Construction of the proposed ACP project in Dowells Draft and East Branch Dowells Branch is **not consistent with** the substantive requirement of the FS planning rule **§219.8(a)(2)(ii)**—‘‘[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,’’ because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. Because there is construction in multiple headwater areas to specific streams, the adverse impact is cumulative. Construction of the proposed ACP project is **not consistent with** FS planning rule **36CFR 219.8(a)(2)(iv)** because of detrimental changes to groundwater quantities and detrimental changes to stream water quality due to increased turbidity and sedimentation. Construction of the proposed ACP project is **not consistent with §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

3.0 DEFICIENT ANALYSIS OF SEDIMENTATION IMPACTS

Stream water turbidity increases with the introduction of sediment to any streams. Stream embeddedness (**Figure 3.0-1**) increases when sediment is deposited within openings among cobbles within a stream bed. The U.S. Environmental Protection Agency identifies turbidity as a primary drinking water standard because it is recognized that chemicals and pathogenic contaminants are adsorbed onto sediment particles. The Save Our Streams program, sponsored at the state level in VA and WV, includes turbidity and embeddedness in stream monitoring protocol. Turbidity is typically measured as nephelometric turbidity unit (NTU) by using a Secchi disk. Embeddedness is measured by pebble count techniques. It is important to evaluate and monitor streams prior to, during, and after any construction which will contribute sediment to streams. However, ACP documents do not address evaluation and monitoring of streams to determine the impacts of sediment transport and deposition to streams.

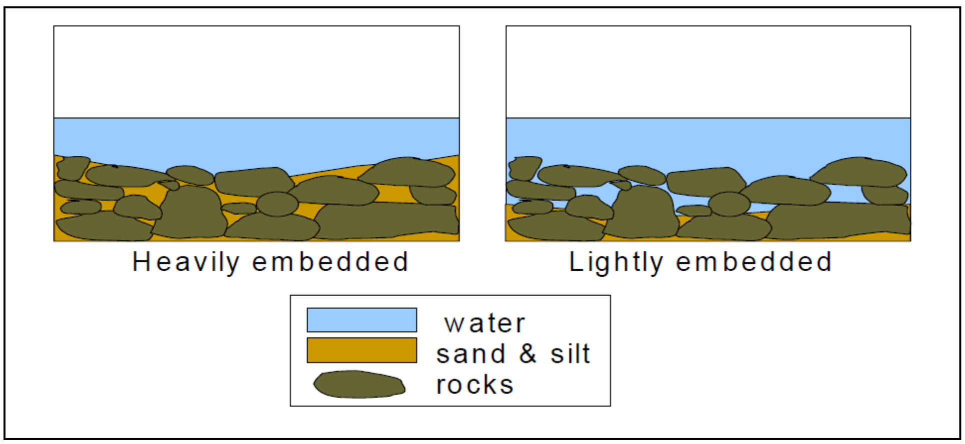


Figure 3.0-1 – Cobbles and pebbles provide aquatic habitats and protection for aquatic organisms. Insect larvae, which constitute the base of the river continuum food chain, reside on the cobbles and pebbles. Minnows and juvenile fish (including trout) hide in the spaces between cobbles and pebbles for protection. When sand and silt fill the spaces between the cobbles and pebbles, the aquatic habitats and protection areas are destroyed. When the aquatic habitats become heavily embedded or are removed for trenching and stream crossing work spaces, they cannot be restored.

The consequences of embeddedness are provided by Jessup and Dressing (2015) as: "1) Displacement of interstitial habitat space; 2) Clogging of water movement under the channel bed (hyporheic zone); 3) Decreased or altered primary algal productivity; 4) Increased macroinvertebrate drift; 5) Abrasion or smothering of gills and other organs; 6) Uptake of sediment-bound toxicants that are increasingly associated with fine particles; and 7) Larger scale homogenization or disturbance of habitat types."
It is stated in the DEQ's Virginia Stormwater Management Handbook, "4.5.3. Habitat and Ecological Impacts", that "As the gravel stream bottom is covered in sediment, the amount and types of microorganisms that live along the stream bottom decline. The stream receives sediment from runoff, but additional sediment is generated as the

stream banks are eroded and this material is deposited along the stream bottom, burying the substrate material of the stream bed, which is habitat for many benthic organisms." Such impacts are inconsistent with **"Code of Virginia, Title 62.1**. **Waters of the State, Ports and Harbors" under "§62.1-11. Waters declared natural resource; state regulation and conservation; limitations upon right to use,** F. The quality of state waters is affected by the quantity of water and it is the intent of the Commonwealth, to the extent practicable, to maintain flow conditions to protect instream beneficial uses and public water supplies for human consumption." Also, such impacts are inconsistent with **9VAC25-260-20 (Water Quality Standards), which explains that turbidity is a substance to be controlled because it can be harmful to aquatic life.** Construction of the proposed ACP project is **not consistent with** the substantive requirement of the FS planning rule **§219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. Because there is construction in multiple headwater areas to specific streams, the adverse impact is cumulative. Construction of the proposed ACP project is **not consistent with §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

3.1 ACP Construction Plans Show Only Limited Best Management Practices

BMPs include sediment erosion control structures intended to reduce stormwater runoff velocities and to reduce the amount of sediment transported in the stormwater runoff. BMPs are required to be part of the Erosion and Sediment Control (E&SC) plan for construction projects. BMPs proposed by ACP and shown on the construction plan sheets incorporate the following BMPs for use in the proposed pipeline construction areas:

- Temporary Diversion Dike
- Silt Fence, Super Silt Fence and Belted Silt Retention Fence
- Compost Filter Sock
- Temporary Slope Breakers
- Trench Plugs
- Erosion Control Blanket/Flexterra/or equivalent
- Vegetative Stabilization

There are numerous ratings for BMPs, providing a range of percent effectiveness values. However, there is agreement that none of the BMPs can provide 100 percent effectiveness. In the Universal Soil Loss Equation guidance document prepared by Peter Wood (Construction Site Soil Loss and Sediment Discharge Calculation, Guidance Document and Calculation Tool, 2015, Wisconsin Department of Natural Resources), the percent effectiveness is provided for the following: silt fence, 40 percent; vegetative buffer, 40 percent. It is stated in the Virginia Department of Environmental Quality (VDEQ) Erosion and Sediment Control Handbook (1992) that sediment traps and sediment basins can achieve, at best, only 60 percent effectiveness. It should be noted that sediment basins are not included on any ACP construction plans. Sediment basins constitute the only commonly used BMP to detain water in a manner consistent with the requirements of the Code of Virginia, **Title 62.1. Waters of the State, Ports and Harbors, Chapter 3.1 State Water Control Law, Article 2.4 Erosion and Sediment Control Law § 62.1-44.15:52** and **Virginia Administrative Code 9VAC25-870-66**.

The VDEQ's silt fence requirements include the following:

- Purposes: 1) intercept and detain small amounts of sediments from disturbed areas during construction; 2) decrease the velocity of sheet flows and low-to-moderate level channel flows, specifically where erosion would occur in the form of sheet and rill erosion.
- The use of silt fences… is limited to situations in which only sheet or overland flows are expected and where concentrated flows originate from drainage areas of 1 acre or less.
- Size of drainage area should be no more than one quarter acre per 100 feet of silt fence length; maximum slope length behind the barrier is 100 feet; and maximum gradient behind the barrier is 50 percent (2:1). Silt fence should be located at least 5 – 7 feet beyond the base of the disturbed slopes with grades greater than 7 percent.
- Can be used in minor swales or ditch lines (concentrated flow) where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cubic foot per second (cfs).
- Not to be used in areas where rock or other hard surfaces prevent the full and uniform depth of anchoring the barrier.
- Silt fence should stand 24-34 inches above existing grade.

Stormwater calculations for sizing BMPs are provided by ERM. However, these calculations do not include areas delineated for sizing 1) silt fence, with requirements for a limit of one-quarter acre per 100 feet of silt fence length and 1 acre for a drainage area for silt fence in minor swales or ditch lines and 2) a requirement for flow no greater than 1 cfs, or or 5 acres for sizing temporary diversion dikes.

3.2 Deficiencies in Soil Loss Calculations and Stream Sedimentation Analysis

The Revised Universal Soil Loss Equation (RUSLE) provides a methodology to estimate soil loss from land areas. RUSLE calculations were provided by ACP for two areas of unknown location in Bath County, VA. The slope length of 100 feet was selected to pertain to that required for slope breakers as a BMP. In the first example, there was an increase from pre-construction soil loss of 0.015 tons per acre per year (t/ac/yr) to post-construction soil loss of 3.7 t/ac/yr, which is an increase of 246 times the pre-construction amount. In the second example, there was an increase from pre-construction soil loss of 0.022 tons per acre per year (t/ac/yr) to post-construction soil loss of 5 t/ac/yr, which is an increase of 227 times the pre-construction amount. This verifies increases in release of sediment to receiving streams as a result of ACP construction activities. **This is inconsistent §62.1-11 and §62.1-44.15:52 and 9VAC25-260-40 because construction impacts will cause sedimentation to the receiving stream, resulting in increased embeddedness in the receiving stream, causing degradation of aquatic habitats.** Construction of the proposed ACP project is **not consistent with** the substantive requirement of the FS planning rule **§219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. Because there is construction in multiple headwater areas to specific streams, the adverse impact is cumulative. Construction of the proposed ACP project is **not consistent with §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

4.0 DEFICIENCIES IN ASSESSMENT OF SEISMIC AND LANDSLIDE HAZARDS

The proposed ACP pipeline is in close proximity to the Central Virginia Seismic Zone. Although ACP states that the pipelines should be capable of withstanding seismic events, there is concern for soil liquefaction. During an earthquake, saturated soil can liquify, moving as a fluid and thereby losing soil strength of the soils supporting the pipeline. Soil liquefaction was reported as a result of the earthquake in Mineral, VA, in 2011.

The Virginia Department of Mines, Minerals, and Energy developed an Earthquake Epicenter Density map (**Figure 4.0-1**) which provides the location of the Central Virginia Seismic Zone. Horton, et al (2015) report that earthquakes trigger landslides, citing landslides that were triggered by the earthquake in Mineral, VA, in 2011. Landslides resulting from the Mineral, VA earthquake occurred in an area extending as much as 152 miles from the epicenter.

In the ACP FEIS, numerous steep slopes along the proposed pipeline route are identified by ACP as slope instability hazard sites. Colluvium is defined as sediments, including clay-sized up to boulder-sized sediments, deposited downslope by mass-wasting (landslides) or overland flow. In the ACP FEIS, colluvium is reported to have been observed on most of the steep slopes along the proposed ACP route. Landslide material moves downslope toward receiving streams, providing an additional threat of turbidity and sediment deposition into receiving streams in Virginia.

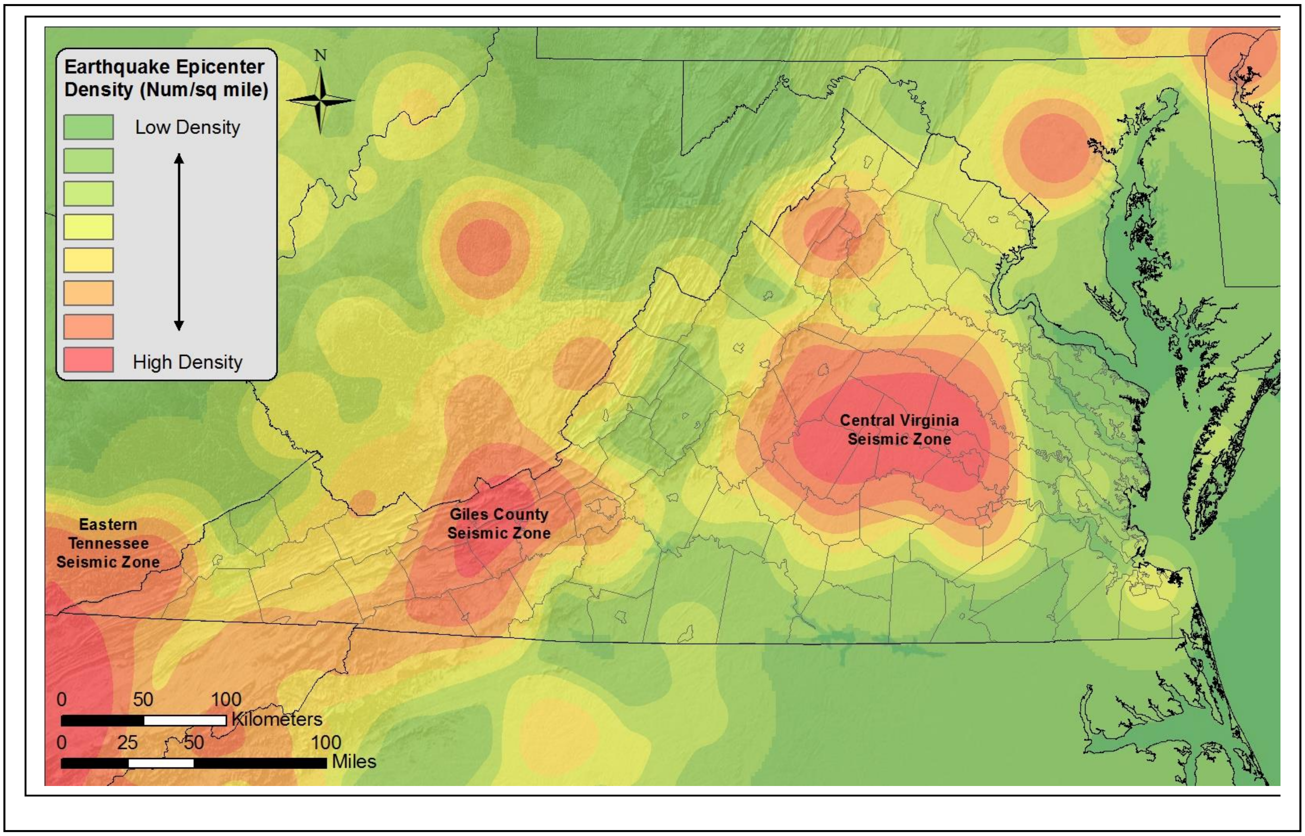


Figure 4.0-1 – Map showing the densities of earthquake epicenters, provided as a color scale indicating the relative densities in numbers per square mile. Three major earthquake zones are identified. The proposed ACP construction areas are in close proximity to the Central Virginia Seismic Zone. This map is from https://dmme.virginia.gov/DGMR/EQHazardMapping.shtml.

5.0 ACP HAS FAILED TO PROVIDE BEST AVAILABLE SCIENTIFIC INFORMATION, SUCH THAT THE FS CANNOT MAKE INFORMED DECISIONS

The FS has failed to observe that ACP has not provided the Best Available Scientific Information (BASI) to inform the Planning Process, specifically FS planning rule §219.3:

- ACP and the FS have failed to consider the facts that support the need to evaluate at the functionally contributing watersheds of first order streams, second order streams, and third order streams (USFWS, 2007). Instead, ACP has provided peak stormwater discharge values based on watersheds from 36 acres to 84,092 acres. Only 20 of the drainage basin areas are less than or slightly greater than 200 acres, which is the typical size for meaningful stormwater discharge calculations.

- ACP dismissed the need to even provide peak stormwater discharge calculations to the WVDEP, stating they were not necessary because post-construction conditions would not differ from pre-construction conditions. However, pre-construction conditions consist mostly of forested ground cover. The VDEQ states in the Virginia Stormwater Management Handbook (2013) that: "When soil is disturbed by grading, stockpiling, and heavy equipment traffic, the soil becomes compacted, structure is lost and porosity decreases. When this happens, the soil's ability to take in water (permeability) is substantially reduced and surface runoff increases. Even if topsoil is stripped, stockpiled and reapplied following construction (a practice DEQ strongly recommends), the resultant loss of structure reduces the permeability of the topsoil. The loss of structure in the topsoil, together with compaction of the subsoil by construction equipment, is so profound that the bulk density of a lawn soil can approach that of concrete… The result is a surface that is *functionally impervious* because the soil's permeability is so greatly reduced."
- The ACP and FS have failed to consider that a forested ground cover is functionally different from a deforested ground cover. The tree canopy in forested areas intercepts precipitation, thereby reducing the fall velocity of raindrops reaching the ground surface. Consequently, forests facilitate increased groundwater recharge and reduced stormwater runoff. The VDEQ Virginia Stormwater Management Handbook (2013) states: "… loss of tree cover in the watershed has resulted in excessive amounts of stormwater runoff." This confirms less groundwater recharge where there is increased stormwater runoff.
- The FS and ACP have failed to recognize impacts to groundwater due to dewatering seeps encountered when leveling work areas and dewatering the pipe trench. The groundwater from dewatered areas is reported by ACP to be diverted to the surface as runoff, which would add to overall surface runoff. The pipes installed for dewatering would remain in place after construction has been completed, resulting in permanent diversion of groundwater to the ground surface.
- The FS DROD states that ACP has prepared a hydrologic sedimentation analysis "… to analyze effects to a wide range of forest resources, including water and aquatic species. The analysis provides a real-world representation of sedimentation hazards to forest resources. The best available data used included the revised universal soil loss equation model (RUSLE) to estimate effects of the proposed activities." However, the soil loss was estimated for only two areas of unknown location in Bath County, VA, with the results concluding a post-construction increase of 246 times the pre-construction soil loss in tons per acre per year (t/ac/yr) and, at the second location, a post-construction increase of 227 times the pre-construction soil loss in t/ac/yr.
- The ACP construction plans indicate only the use of silt fence, compost filter socks, waterbar/slope breakers, and trench breaker/plugs. These BMPs are reported in the literature to be as much as 40 percent effective, indicating that most of the sediment will be directed into receiving streams. Increased turbidity and sedimentation in streams will result, thereby reducing water quality and

increasing embeddedness in the streams. As a consequence, aquatic habitats will be degraded. It should be noted that there are no sediment basins shown on the construction plans, even though Virginia law **§62.1-44.15:28.A.10** requires that stormwater management practices must be "designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm…". Sediment basins constitute the only BMP which can provide the mandatory water detention.

- Because the ACP has provided the conclusion that post-construction peak stormwater discharge will be equal to pre-construction peak stormwater discharge due to failure of acknowledging the use of correct watershed delineations and correct ground cover curve numbers in stormwater discharge calculations, there has been no consideration of increased downstream stream bank erosion due to increased frequency of peak stormwater discharge. in Chapter 4 of the VDEQ Virginia Stormwater Management Handbook (2013), it is stated in section "4.5.2. Stream Channel and Floodplain Impacts" that: "Increased peak discharges for a developed watershed can be two to five times higher than those for an undisturbed watershed. As runoff velocities increase, it takes less time for water to run off the land and reach a stream or other water body (time of concentration). Streams in developed areas are often characterized as very "flashy" or "spiky" because of their response to these altered runoff characteristics. This characterization translates into the sharp peak and increased size of the post-development hydrograph… The combination of greater volumes of runoff more often and at higher flow rates can create altered stream flows, localized flooding, stream channel degradation and property damage, even in small storm events."
- The ACP has failed to recognize available scientific information that landslides and soil liquefaction can result from earthquakes and that the proposed ACP construction is in close proximity to earthquake zones recognized by the Virginia Department of Mines, Minerals, and Energy.

6.0 CONCLUSIONS

Using scientific documentation, there is compelling evidence that the Forest Service should not authorize the use and occupancy of National Forest System (NSF) land for ACP to construct a gas pipeline that crosses NFS lands administered by the MNF and GWNF. Due to deforestation in headwater areas of upland first order high gradient streams and increased sedimentation due to increased stormwater discharge to receiving streams, the proposed ACP construction activities in upland areas will result in direct and indirect discharge to waters of the United States and are deficient with respect to protections addressed in applicable Water Quality Standards in **9VAC25-260-5, *et seq***. The proposed ACP construction activities would result in degradation to upland headwater areas of upland first order high gradient streams as follows:

1) **Decrease in the groundwater table, groundwater quantities, and hydraulic head of groundwater** due to deforestation, soil compaction, seep diversion, and trench dewatering. This results in **decreased groundwater** available 1) to maintain seeps and springs which supply water to upland headwater areas, including wetlands, in first order stream watersheds and also 2) to maintain groundwater baseflow to provide water to receiving streams during times of drought. **This is inconsistent with Code of Virginia §62.1-11 because the quantity of groundwater will be decreased. This is inconsistent with FS planning rule 36CFR 219.8(a)(2)(iv)** because of **detrimental changes to groundwater quantities** and detrimental changes to stream water quality due to increased turbidity and sedimentation.

2) **Degradation of conditions, specifically increased light and temperatures** due to deforestation in upland headwater areas of first order streams. Filtered light and lower temperatures in upland headwater areas are required to sustain aquatic habitats for aquatic macroinvertebrates at the base of the food chain. **This is inconsistent with Code of Virginia §62.1-11 because construction activities will cause failure to maintain flow conditions to protect instream beneficial uses**. **9VAC25-260-20** (Water Quality Standards) includes limits on increases in stream temperatures. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

3) **Degradation of ecological connectivity** for the river continuum due to destruction of aquatic habitats in upland headwater areas of first order streams. Destruction of the aquatic habitats for macroinvertebrates at the base of the food chain in upland headwater areas will disrupt connectivity with downstream aquatic organisms. **This is inconsistent with §62.1-11 because degradation of the upland headwater areas will result in failure to maintain flow conditions to protect instream beneficial uses. This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

4) **Degradation of receiving streams** within watersheds crossed by the proposed ACP construction due to **increased sedimentation**, causing increased turbidity and embeddedness. Increased turbidity causes reduced water quality for filter feeding aquatic organisms and also obstruction of gills in fish. ACP has not accurately delineated watersheds 1) to determine accurate peak stormwater discharge to receiving streams or 2) to determine increased soil loss due to changes in ground cover caused by the proposed ACP construction. **This is**

inconsistent with §62.1-11 because degradation of the upland headwater areas will result in degradation of water quality required to protect instream beneficial uses. 9VAC25-260-20 (Water Quality Standards) explains that turbidity is a substance to be controlled because it can be harmful to aquatic life. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

5) **Deficiencies in Best Management Practices**: the Best Management Practices (BMPs) described for use during the proposed ACP construction in upland headwater areas are deficient and will result in **increased sedimentation** to receiving streams and increased embeddedness. The BMPs listed by ACP for use at the proposed construction areas do not include sediment basins, which would constitute the only BMP 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. **This is inconsistent with §62.1-44.15:52 because of ineffective control of soil erosion and sediment deposition which will result in unreasonable degradation of stream water and stream channels. This is inconsistent with the substantive requirement of the FS planning rule §219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

6) The RUSLE calculations provided by ACP are deficient because they were only provided for two areas of unknown location in Bath County, VA. The slope length of 100 feet was selected to pertain to that required for slope breakers as a BMP. In the first example, there was an increase from pre-construction soil loss of 0.015 tons per acre per year (t/ac/yr) to post-construction soil loss of 3.7 t/ac/yr, which is an increase of 246 times the pre-construction amount. In the second example, there was an increase from pre-construction soil loss of 0.022 tons per acre per year (t/ac/yr) to post-construction soil loss of 5 t/ac/yr, which is an increase of 227 times the pre-construction amount. This verifies increases in release of sediment to receiving streams as a result of ACP construction activities. **This is inconsistent with §62.1-11 and §62.1-44.15:52 and 9VAC25-260-40 because construction impacts will cause sedimentation to the receiving stream, resulting in increased embeddedness in the receiving stream, causing degradation of aquatic habitats. Additionally, 9VAC25-260-20** (Water Quality Standards) explains that turbidity is a substance to be controlled because it can be harmful to aquatic life. **This is inconsistent with the substantive requirement of the FS planning rule §219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

7) **Inadequate assessment of landslide potential and seismic activity potential**. The proposed ACP route is in close proximity to the Central Virginia Seismic Zone, where the epicenter of the Mineral, Virginia earthquake occurred. Liquefaction of soils was reported during the earthquake. If soil liquefaction occurs where the soils are supporting a pipeline, the soils could collapse and a pipeline rupture could occur where the pipeline is not supported. Colluvium has been observed by ACP on numerous steep slopes along the proposed ACP route. Colluvium is defined as sediment which continually moves downslope as a form of soil landslide. Because earthquakes are known to cause landslides, the steep slope areas would be subject to greater landslide activity during an earthquake. Soil moves downslope during a landslide, delivering sediment to receiving streams and thus causing increased turbidity and embeddedness in receiving streams. **This is inconsistent §62.1-11 and §62.1-44.15:52 because the increased sedimentation to receiving streams will result in degradation of the stream water and aquatic habitats and will impair beneficial uses of the receiving streams.** Additionally, **9VAC25-260-20** (Water Quality Standards) explains that turbidity is a substance to be controlled because it can be harmful to aquatic life. **This is inconsistent with the substantive requirement of the FS planning rule §219.8(a)(2)(ii)**—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

8) **Cumulative and permanent degradation of receiving streams and reduced groundwater quantities** will result from deforestation, soil compaction, seep diversion, and trench dewatering in upland areas crossed by the proposed ACP construction. Increased stormwater discharge results from deforestation, soil compaction, seep diversion, and trench dewatering (which directs water from pipeline trenches to the ground surface). Cumulative and permanent impacts will also result from reduced groundwater recharge due to deforestation, soil compaction, and trench dewatering. **This is inconsistent with §62.1-44.15:52 and 9VAC25-260-40 because the construction areas will not be reforested**

and soil functions cannot be restored to pre-construction conditions, thereby resulting in continual increased stormwater discharge, which will cause downstream stream bank erosion, resulting in increased embeddedness. The decreased groundwater recharge will lower the water table and the hydraulic gradient such that water will not be available to seeps and springs in the headwater areas of high gradient first order streams or downstream as groundwater baseflow supply for streams during times of drought. The impact is cumulative because numerous upland first order stream tributaries to higher order streams will increase sediment transport and stream bank erosion downstream. This is inconsistent with the substantive requirement of the FS planning rule §219.8(a)(2)(ii)—''[The plan must include plan components to maintain or restore] Soils and soil productivity, including guidance to reduce soil erosion and sedimentation,'' because the change in ground cover from a forested condition to a functionally impervious area will permanently increase stormwater discharge, causing continual downstream stream bank erosion. **This is inconsistent with FS planning rule §219.8(a)(3)(i)** because cumulative impacts to aquatic species in headwater areas will degrade the function and connectivity of the ecological integrity of riparian areas.

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My education includes a bachelor's degree in Geology and a doctoral degree in Marine Science (specializing in Marine Geology), both from the College of William and Mary in Williamsburg, VA. I have a Credential in Ground Water Science from Ohio State University and I am a Licensed Professional Geologist. I have held teaching positions at the high school level and at the college level, and have provided geology and hydrogeology presentations, workshops, and classes to state and federal environmental employees, to participants in the Regional Conference in Cumberland, MD for the American Planning Association, and to participants in the WV Master Naturalist classes. I have served as an expert witness in hydrogeology before West Virginia government agencies.

As a Hydrogeological Consultant (2000 – Present), I have conducted hydrogeological investigations, provided hydrogeological assessment reports, served as an expert witness in hydrogeology before the West Virginia Public Service Commission in three cases and before the West Virginia Environmental Quality Board in one case, and provided numerous presentations and workshops in hydrogeology to state and federal environmental employees (including USFWS and WV FEMA Managers), participants in the Regional Conference in Cumberland, MD for the American Planning Association, participants at civic and landowner meetings, and participants in the WV Master Naturalist classes.

As a Senior Geologist for the Virginia Department of Environmental Quality (1997-1999), I determined direction of groundwater flow and the pollution impacts to surface water and groundwater at petroleum release sites and evaluated corrective actions conducted where petroleum releases occurred. At sites where the Commonwealth of Virginia assumed responsibility for the pollution release investigation and corrective action implementation, I managed the site investigations for the Southwest Regional Office of the Virginia Department of Environmental Quality (DEQ). This included project oversight from contract initiation through closure.

As a Senior Geologist and Project Manager for the Environmental Department at S&ME, Inc. (Blountville, TN, 1992-1997), I conducted geology and groundwater investigations. I supervised technicians, drill crews, geologists, and subcontractors. The investigations were conducted in order to obtain permits for landfill sites and to satisfy regulatory requirements for corrective actions at petroleum release sites. My duties also included conducting geophysical investigations using seismic, electrical resistivity, and ground penetrating radar techniques. I conducted numerous environmental assessments for real estate transactions. I also conducted wetlands delineations and preparation of wetlands mitigation permits.

As the District Geologist for the Virginia Department of Transportation (1985-1992), my job duties included obtaining and interpreting geologic data from fieldwork and review of drilling information in order to provide foundation recommendations for bridge and road construction. My duties included supervision of the drill crew and design of asphalt and concrete pavements for highway projects. Accomplishments included preliminary foundation investigations for interstate bridges and successful cleanup of leaking underground gasoline storage tanks and site closures at numerous VDOT facilities.

While earning my doctoral degree at the College of William and Mary, I worked as a graduate assistant on several grant-funded projects. My work duties included measuring tidal current velocities and tidal fluctuations at tidal inlets; land surveying to determine the geometry and morphology of numerous tidal inlets; determining pollution susceptibilities of drainage basins using data from surface water flow parameters, hydrographs, and chemical analyses; developing a predictive model for shoreline erosion during hurricanes based on calculations of wave bottom orbital velocities resulting from various wind velocities and directions; performing sediment size and water quality analyses on samples from the Chesapeake Bay and James River; conducting multivariate statistical analyses for validation of sediment laboratory quality control measures; reconnaissance mapping of surficial geologic materials in Virginia, North Carolina, and Utah for publication of USGS Quaternary geologic maps; teaching Introductory Geology laboratory classes at the College of William and Mary; and serving as a Sea Grant intern in the Department of Commerce and Resources, Virginia.

EDUCATION:

College of William and Mary
Williamsburg, VA 23185
Ph.D., 1984
Major: Marine Science (Marine Geology)

College of William and Mary
Williamsburg, VA 23185
B.A., 1972
Major: Geology

Flint Hill Preparatory
Fairfax, VA
High School Diploma, 1968

JOB-RELATED TRAINING COURSES:

2007: Certified Volunteer Stream Monitor, West Virginia (Dept. of Environmental Protection)
2006: Certified Master Naturalist, West Virginia (Dept. of Natural Resources)
1996: Karst Hydrology, Western Kentucky University
1996: Global Positioning Systems (GPS) for Geographic Information Systems (GIS) applications, seminar conducted by Duncan-Parnell/Trimble
1995: Safe Drinking Water Teleconference, sponsored by the American Water Works Association
1992-1998: OSHA Hazardous Waste Site Supervisor training with annual updates
1990: Credential in Ground Water Science, Ohio State University

JOB-RELATED LICENSE:

Licensed Professional Geologist: TN #2529

PROFESSIONAL ORGANIZATIONS

West Virginia Academy of Sciences
National Speleological Society
Geological Society of America
National Ground Water Association