Wintergreen
88 Wintergreen Drive
Wintergreen Resort, VA 22967-2162

Wintergreen Property Owners Association
Jay W. Roberts, *Executive Director*
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June 12, 2018

Office of Public Information
Department of Environmental Quality
P.O. Box 1105
Richmond, Virginia 23218

RE: Sufficiency of the NWP 12 conditions related to sites VA AP-10237 (MP 158.7) and VA AP-10237 (MP 158.9)

DEQ,

On behalf of property owners in Augusta and Nelson County, thank you for allowing public comment on the sufficiency of the Army Corps of Engineers (Corps) Nationwide Permit 12 (NWP 12) as it relates to the Commonwealth's 401 certification process. Wintergreen has already shared abundant information supporting the need for careful review, given the unique environmental and public safety challenges present where the ACP passes the only entrance and exit of our community. As required, this filing includes an analysis of the inadequacies of NWP 12 for this project and provides additional new information showing current site conditions, and clear evidence of pressurized ground water within the ACP route. This new evidence reinforces the need for DEQ to provide additional scrutiny of the environmental and public safety impacts of the ACP project near milepost (MP) 158.7, and for DEQ to not accept the previous insufficient review the Corps deems acceptable as part of NWP 12.

**Site Specific Conditions:**

VA AP-10237 is located just outside the entrance and exit of Wintergreen, located in both Nelson and Augusta Counties. The Atlantic Coast Pipeline (ACP) crosses the pristine headwaters of the South Fork of the Rockfish River at mileposts 158.7 and 158.9. In addition to its location at the entrance and exit of the Wintergreen Community, this section of the Rockfish River flows through the community of Beech Grove. Because of this, the South Fork of the Rockfish serves both a recreational use and as a source of food for those that fish this river. The Virginia Department of Game and Inland Fisheries (DGIF) encourages these recreational benefits by managing this river as a trout fishery, regularly stocking fish throughout the year.

**Insufficiency of NWP12:**

During his campaign for the governorship, Governor Northam committed that there would be a stream-by-stream analysis of the impact of the pipeline. We appreciate that this places a strain on DEQ's resources. However, the appropriate response is to provide additional resources for DEQ so that it can take full responsibility for a stream-by-stream analysis. It would be wrong to default to relying on the Corps when, as detailed below, they have promulgated NWP12, which is seriously deficient and incapable of providing the first-class environmental protections that the citizens of the Commonwealth deserve.

The Corps NWP12 is overly broad and lacks sufficient details to address individual site-specific challenges especially in upland areas like Wintergreen. A careful read of the Corps "2017 Nationwide Permits Final Decision Documents - Nationwide Permit 12" provides numerous examples of the limitations of NWP 12, acknowledging the need to include additional Federal, State, and Local authorizations as part of utility project permitting. Page 5 states "In some cases, activities authorized by an NWP may require other federal, state, or local authorizations. It continues: "In such cases, a provision of the NWPs states that an NWP does not obviate the need to obtain other authorizations required by law." Recognizing the limits of the NWP to satisfy the unique challenges of every site the Corps allowed Corps Staff "discretionary authority" to require additional individual permits, modify NWPs, adding special conditions, etc. The Corps readily admits regional conditions warrant additional scrutiny and flexibility when applying the NWPs. Going a bit further the Corps states on page 6 "All NWPs that authorize activities that may result in discharges into waters of the United States require water quality certification."

Given the number of water bodies impacted by the ACP project, we are somewhat sympathetic to the approval challenge facing VA DEQ. However, the responsibility to protect Virginia water is the Commonwealths burden. Page 7 of the Decision Document states the Corps "do not have the legal authority to regulate the construction, maintenance or repair of upland segments of pipelines or other utility lines" and provides examples from the Flanagan South pipeline. The Corps expertise lies within navigable river crossings where site conditions are more likely to be consistent from one site specific local area, to another. They recognize the unique challenges facing construction in upland areas, allowing staff flexibility in how or even if the NWPs can be applied. On page 10 of the Decision Document the Corps states: "Concerns about the use of this NWP in Appalachia are more appropriately addressed by the appropriate division engineer, who has the authority to modify, suspend, or revoke the NWP in a specific region."

DEQ's reliance on using the NWPs to satisfy its own work, is misplaced. In many instances the Corps make it clear they do not have legal authority and give Corp employees wide flexibility in how they apply the NWP. If the Corps acknowledge their limitations, DEQ must also acknowledge the Corps limitations. If the Corps acknowledge regional and individual site conditions warrant flexibility in applying the NWPs then DEQ must recognize it cannot approve the NWP across the Commonwealth. On page 8 of the Decision Document, the Corps states: "the purpose of the NWPs, as well as regional general permits, is to provide a streamlined authorization process for activities that result in no more than minimal individual and cumulative adverse environmental effects". The NWP simply cannot be used as justification for DEQ not having to scrutinize construction of a pipeline that covers over 300 miles and impacts over 1,000 water body crossings in Virginia. "The purpose of the NWPs, as well as regional general permits, is to provide a streamlined authorization process for activities that result in no more than minimal individual and cumulative adverse environmental effects".

**Conflicting Requirements:**

The Nationwide Permit (NWP-12) issued for stream crossings is partly defined as follows: "Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in preconstruction contours." (Source: USACOE Nationwide Permit #12)

The ACP, in its required environmental filings for Fish, Wildlife, and Vegetation (Resource Report #3) indicates that for the 998 crossings streams and water features identified as Fisheries, FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Waterbody Construction and Mitigation Procedures, as well as, ACP's Erosion and Sediment Control plan, will be followed.

Their Water Resources Report (Resource Report #2- water Use and Quality) makes no specific claim of adherence to the Erosion Control plan and in fact partly amends the report #3 claim as follows: "Construction across waterbodies will be completed according to FERC guidelines, as well as local seasonal restrictions, to minimize impacts on aquatic resources (i.e., fish, freshwater mussels, etc.). Public water intakes within three miles of the waterbody crossing site will notified according to FERC procedures prior to construction. The crossing method for each wetland will depend on site-specific weather conditions, soil saturation, and soil stability."

The Water Resources Report #2 does claim adherence to FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Waterbody Construction and Mitigation Procedures as their strategy to avoid impact to groundwater flow and recharge.

FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Waterbody Construction and Mitigation Procedures requires Permanent Erosion Control Devices (Section V) such as trench breakers to inhibit the flow of subsurface water and Permanent Slope Breakers to divert surface water and reduce runoff velocities. Permanent Slope breakers are to be constructed and maintained in all areas except cultivated areas and lawns.

Therefore, multiple conflicts exist:

1. ACP seems to offer no plan to use a VDEQ approved Erosion and Sediment Control plan unless crossing a water body identified as a fishery.
2. Assuming that is a reporting oversight and ACP will instead, address all stream crossings using FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Waterbody Construction and Mitigation Procedures they intend to use trench breaker applications to disrupt groundwater flow. By design, placement of these items may permanently disrupt recharge of wetlands or stream crossings.
3. Also assuming that ACP will address all stream crossings using FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Waterbody Construction and Mitigation Procedures they will use Slope breaker applications to disrupt surface water flow. Such applications are described as physical diversions of water built from soil, stone, or functional equivalent. By design, placement of these items may permanently disrupt recharge of wetlands or stream crossings. Further, should the placement of these follow the prescribed spacing, their presence may be required in jurisdictional areas and thus change the preconstruction contours.

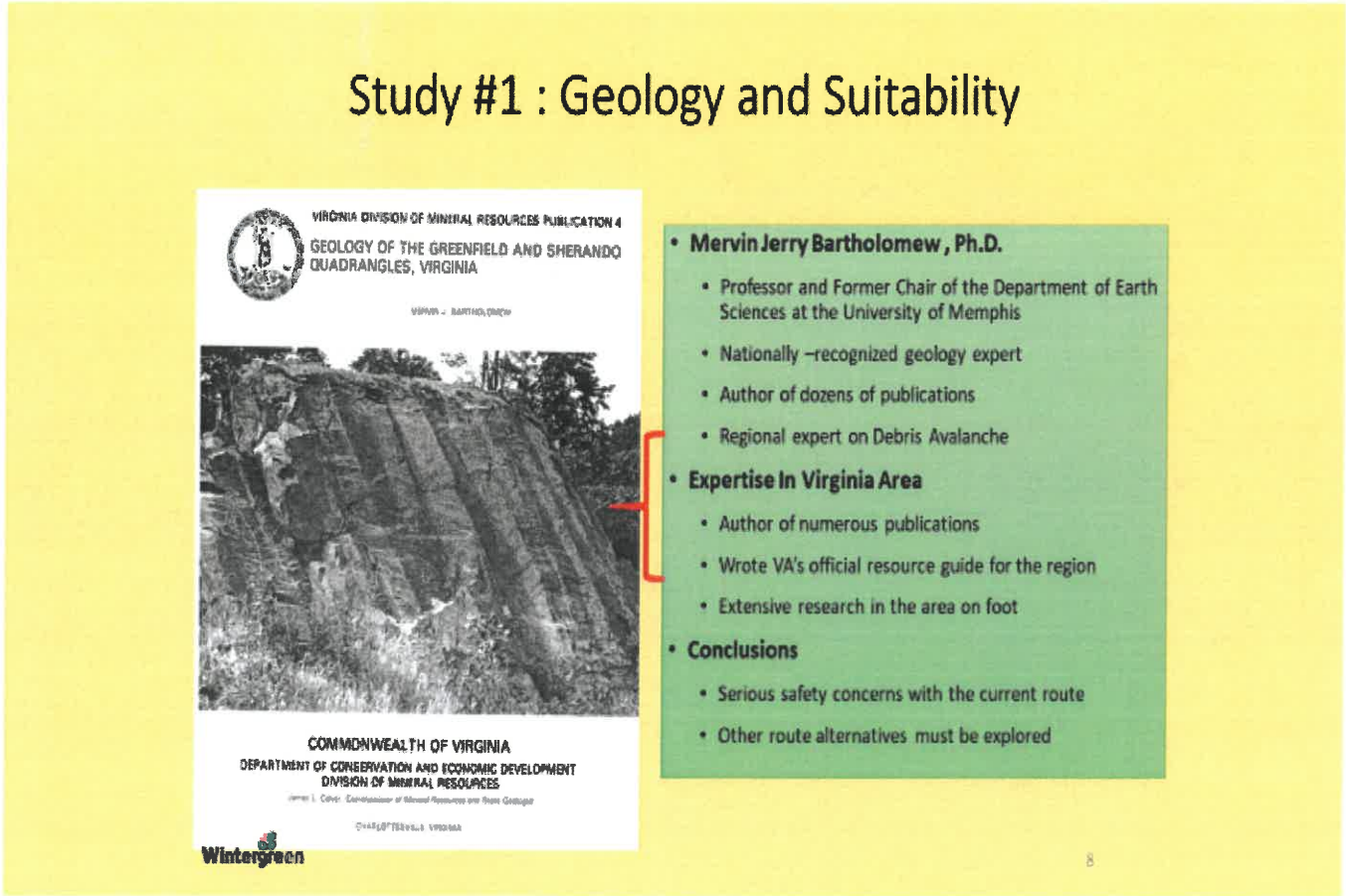
In Summary, certification for issuance of the Nationwide Permit 12 should be granted ONLY AFTER compliance with basic permit conditions is affirmatively demonstrated. As proffered by the pipeline developers, current intention appears to be directly, or at least potentially, in conflict with requirements of the permit. Specifically, the Nationwide permit requires no change in predeveloped topography, yet the construction standards set forth by the developer indicates that permanent water diversions and water barriers be installed without regard to

jurisdictional wetlands or streams. Further, the Nationwide permit specifically prohibits construction and backfill in such a manner as to drain waters of the US however the construction standards set forth by the developer indicates that trench breakers are to be installed as permanent impediments to subsurface water flow, without regard to jurisdictional wetlands or streams.

**Site Specific Concerns:**

The Wintergreen Property Owners Association (WPOA), Friends of Wintergreen (FOW), Friends of Nelson (FON) and other groups have shared sufficient evidence that suggest upland stream crossings warrant careful individual review by DEQ.

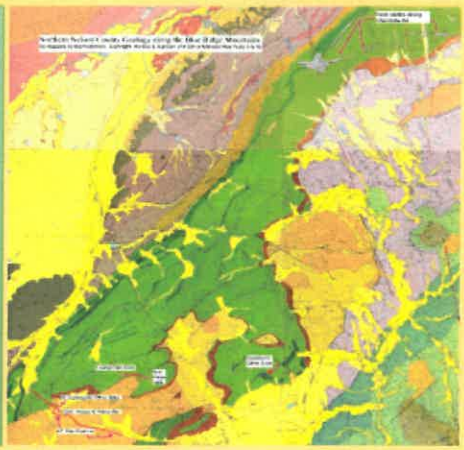
As by way of example, MP 158.7 and 158.9 are both located in steep mountainous terrain well documented to include unstable colluvial deposits and geologic rock layers that increase instability. In reports shared with FERC and DEQ, the presence of significant amounts of colluvial material, overtop of southeast sloping bedrock make debris avalanche contamination of the South Fork of the Rockfish River highly likely. This debris avalanche potential increases dramatically with the deforestation of the steep slope rights of way. The risk grows even larger when the deforestation of steep slopes is combined with the penetration of large reservoirs of ground water held in faults along the Horizontal Directional Drill (HDD) path and directly underneath unstable unconsolidated colluvial material.



# Study #1 : Geology and Suitability

## Debris Flow, Debris Avalanche, Rock Slide Failures

- Along the east face of the Blue Ridge Mountains and especially in Reeds Gap area, failures are common:
  - Especially in the Catoctin Formation where foliation or bedding plane contacts are dipping southeast and parallel to the slope of the hillside.
  - Occurred on slopes where man-made changes have been made to the terrain
  - Man-made excavation less intrusive than that planned for the pipeline has permanently altered drainage or the base of the slope.
- Rain events are typically the catalyst precipitating failures
- The map shows the location of a number of recent failures and the location of the proposed ACP across the Pond Hollow Debris Flow Collection Basin.



**Wintergreen Actions**

- Previous slope failures and stream damage led to decision to avoid all construction in these areas
- No homes were built in this section due to the instability

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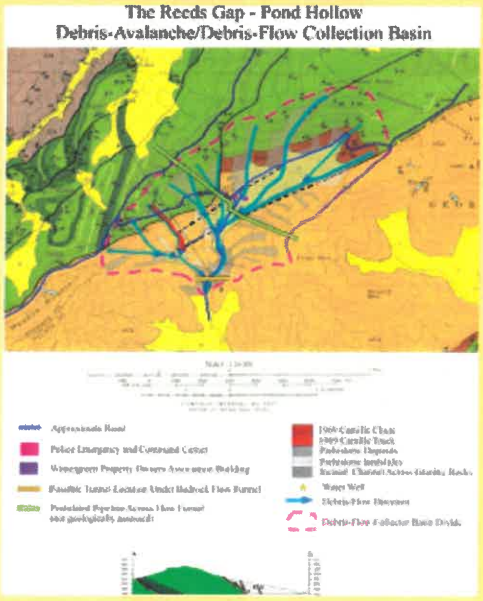
# Fault Zones, Colluvial Material, Rock Layers and Ground Water

- Pipeline passes through three fault zones, all known to carry large amounts of ground water
- Unstable colluvial material is spread throughout this area
- The "dip" of the rock layers increases instability
- Extremely steep slopes are common, some of which exceed 65%
- All of these problems surround the only Entrance/Exit for the Community

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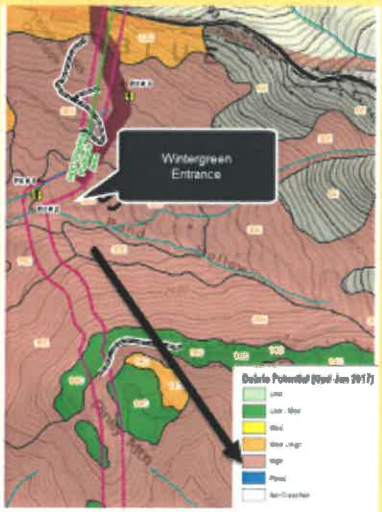
# Study #2: Field Verification of Soil and Geologic Concerns with the ACP

- Study by **Blackburn Consulting Services and Soil Foundation evaluated ACP's relevant FERC submissions, other research and then conducted onsite field verification**
- Identified Wintergreen as the highest risk for debris flows/landslides and unsuitable for pipeline construction.
- Concluded that ACP did not adequately:
  - *identify soils and landforms that are prone to debris flows/landslides*
  - *plans to mitigate ,if possible, those site-specific hazards that can put people, property and water quality at extreme risk.*
- Recommend that ACP :
  - *update its corridor studies with more detailed topographic analysis*
  - *perform an Order 1 soil study along ridgetops and steep slopes (as also requested by USFS)*
  - *identify and map all recent, historical, and potential debris flow areas within the pipeline alignment and its buffer*
  - *enlarge the study area to 525 feet from the current 125 feet.*

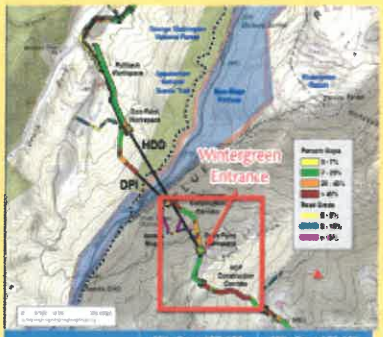



Source: Analysis and Field Verification of Soil and Geologic Concerns with the Atlantic Coast Pipeline in Nelson County VA, Blackburn Consulting Services, LLC. January 2017



# Study #3: Drilling Through The Blue Ridge Mountains For the Atlantic Coast Pipeline

- Study focused on potential issues associated with Reed's Gap area under the Blue Ridge Parkway
- Given the topographic and geophysical challenges at the site, it was concluded:
  - Significant stream impacts
  - Insufficient investigation of terrain and drill path
  - Drilling risks are substantial
  - Entirely new set of issues arise if fallback to Open Trench construction method is utilized




| | Mile Post 157-158 Western Slope | Mile Post 158-159 Eastern Slope |
|---|---|---|
| Total Stream Crossings | 14 | 5 |
| Perennial Streams | 3 | 4 |
| Intermittent Streams | 10 | 1 |
| Blasting Within 1000 Feet | 7 | 4 |
| In-Stream Blasting | 5 | 1 |
| Time-of Year Restrictions | 11 | 3 |

Source: A High Risk Proposal, Drilling Through The Blue Ridge Mountains For the Atlantic Coast Pipeline, 02/06/2017, Dominion Pipeline Monitoring Coalition.

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All of the evidence these groups have presented to date suggests the need to carefully scrutinize the engineering of the ACP in the Wintergreen area. Failure to do so risks not only damage to the Rockfish River and ground water, the threat of debris avalanches present an enormous public safety risk to an entire mountain community. Given what is at stake, DEQ should not rely on the Corps for the extra scrutiny required to construct a pipeline in upland areas. Instead, DEQ should carefully review the project around MP 158.7 as part of DEQ's obligations to the citizens of the Commonwealth.

Building on the foundation already laid through numerous studies, WPOA offers additional NEW evidence to suggest DEQ must scrutinize environmental risks in the vicinity of MP 158.7. This information is included within this submittal and we welcome an opportunity to discuss the findings in detail.

**Ground Water and Unstable Slopes:**

Wintergreen has repeatedly shared concerns over the bedrock geology present around MP 158.7. The VA Department of Mines and Minerals publication was used extensively in this report and an image from the report is included on the left side below. The photo on the right is a LiDAR image of the same area, showing significant areas of concern in and around the ACP route.

## Wintergreen Pipeline Area LiDAR

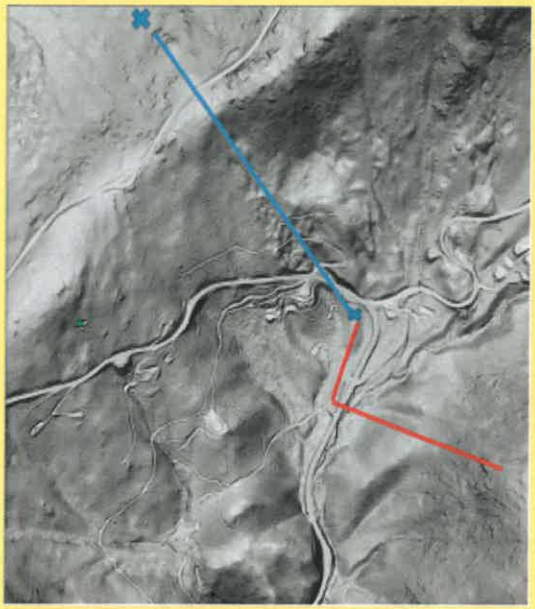

Sherando Geology – 1:8,000 Scale
Overlaid on 2016 LiDAR (1-meter resolution)

1:8,000 Scale
2016 LiDAR (1-meter resolution)

The following slides show the path of the ACP relative to the geology known to exist in the area.

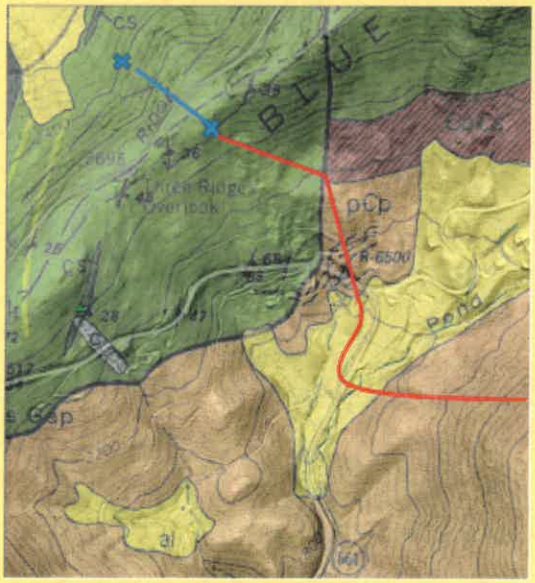
## Wintergreen HDD Path


Sherando Geology – 1:8,000 Scale
Overlaid on 2016 LiDAR (1-meter resolution)

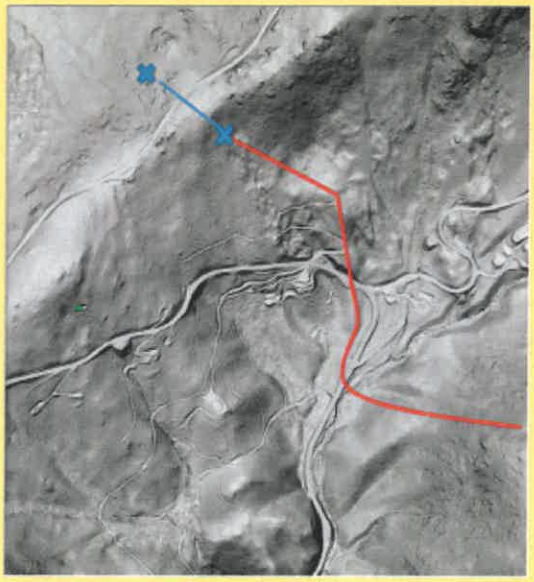


1:8,000 Scale
2016 LiDAR (1-meter resolution)

## Wintergreen Alternative HDD Path

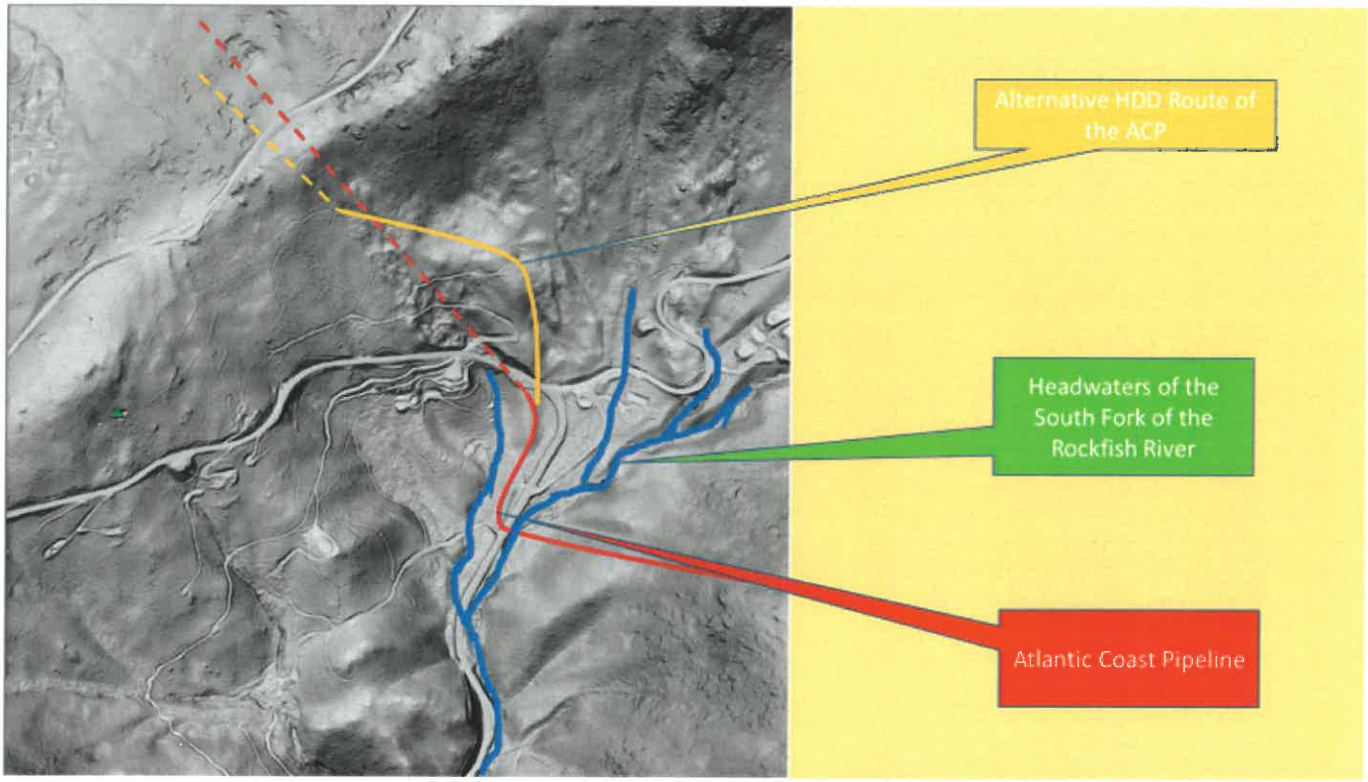



Sherando Geology – 1:8,000 Scale
Overlaid on 2016 LiDAR (1-meter resolution)

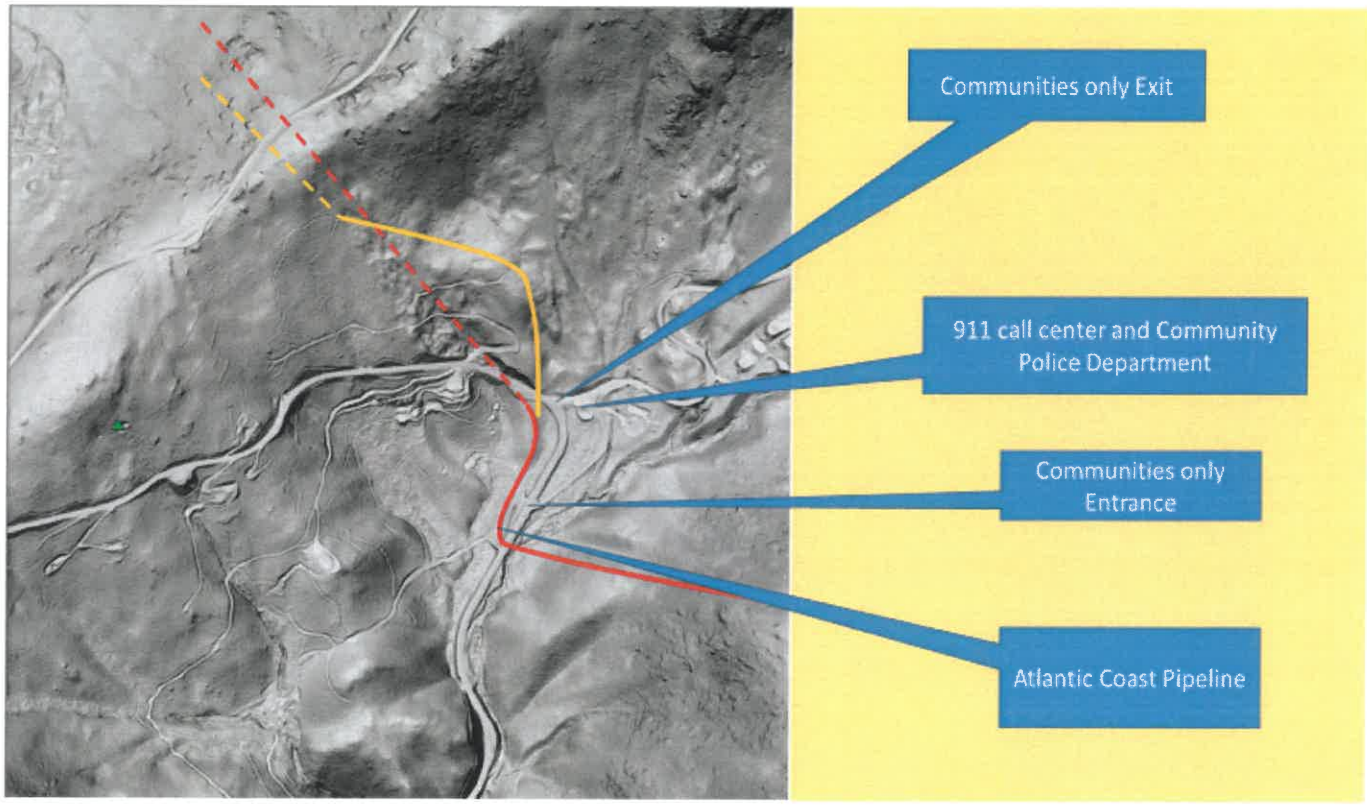


1:8,000 Scale
2016 LiDAR (1-meter resolution)

The Lidar image below shows the proximity of the ACP and the headwaters of the Rockfish River.

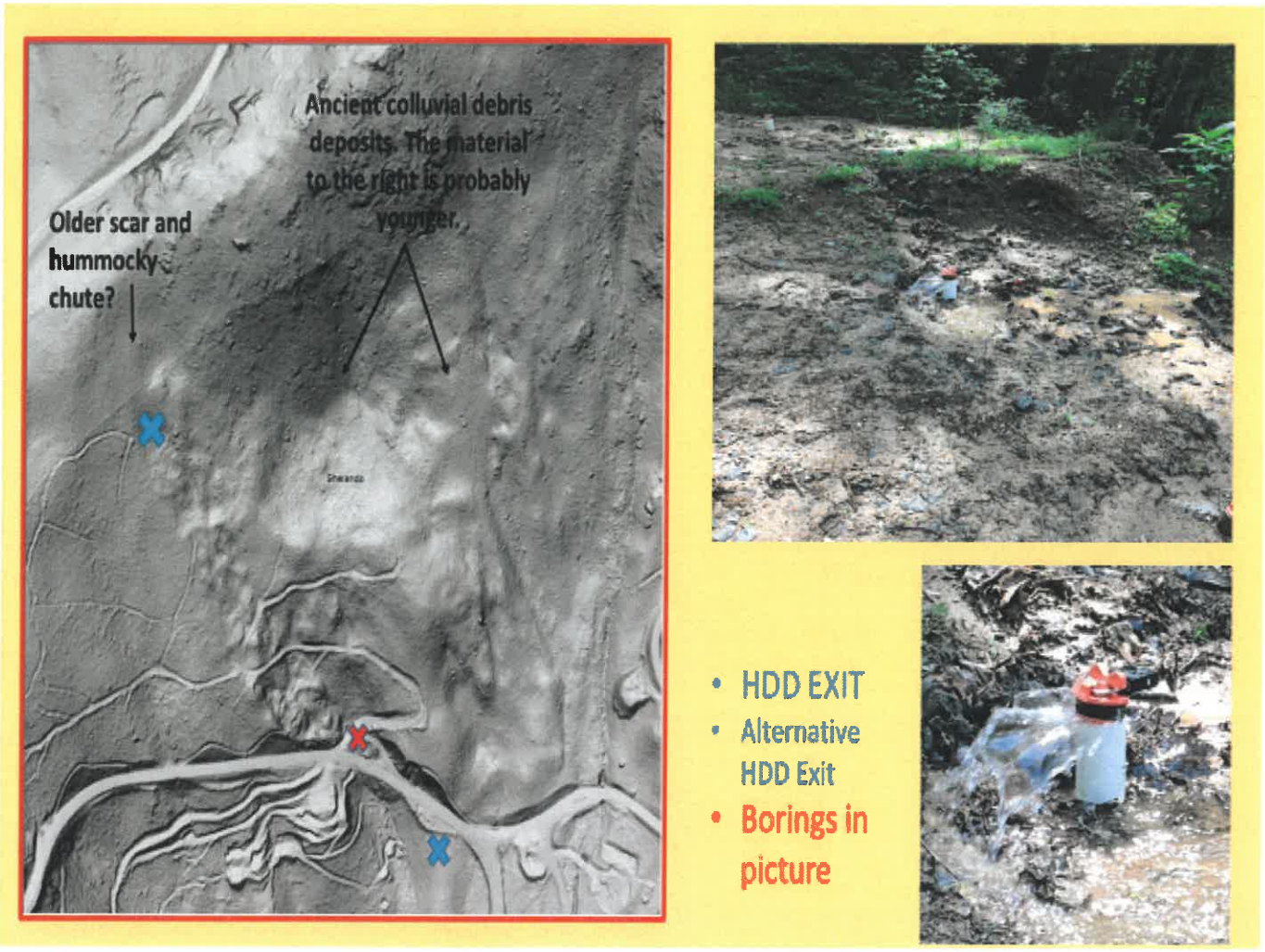



Careful review of the LiDAR images provided helps identify areas of instability, previous slide areas, the proximity of stream, roads, Wintergreen's only entrance and exit to these areas and the path of the ACP.

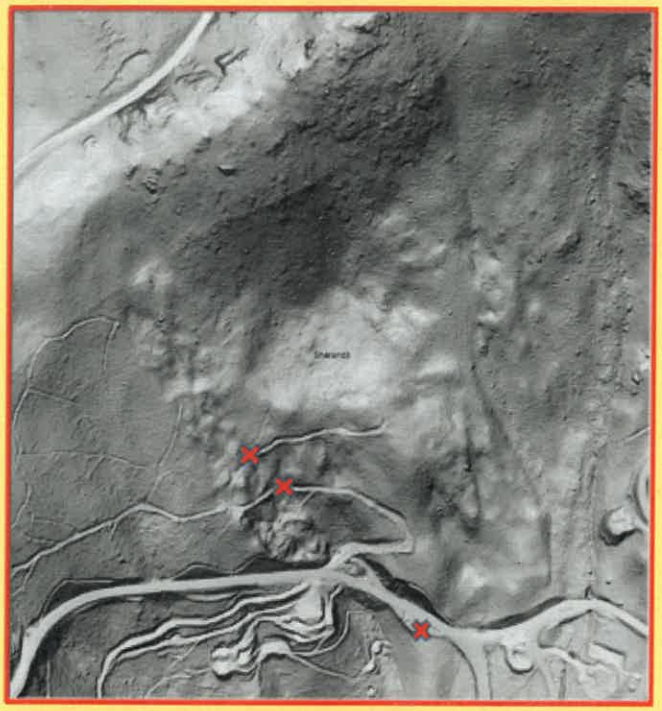


In the reports provided, concerns over ground water are a common theme. These concerns include contamination of the ground water through the HDD process as well as releasing ground water into unstable material along the path of the ACP.

As part of the project planning, ACP conducted soil borings along the HDD path. These boring locations are easily found and as predicted in the reports shared, show clear evidence of significant ground water. The slide below references one of these boring locations and provides evidence of the extent of the ground water at risk AND the potential source for colluvial material destabilization.




As shown in the bottom right of the slide above, the borings in this area encountered water significant enough to force the pressure cap off the original bore hole. This one penetration of the faults identified in the geology report provides clear evidence of significant ground water under significant pressure. This water is currently uncontained and seeping into the colluvial material on a steep slope directly above the HDD site. This evidence and the knowledge that other borings along the HDD show signs of similar water challenges should be cause for concern for the ACP, DEQ, FERC, and the Corps. It is important to note that the Wintergreen Community uses the ground water held in these faults as an integral part of the community's potable water and fire protection supply. If the penetration of this potable water source by the HDD process; releases, contaminates, or in any way compromises this important well water source, an entire mountain community will suffer the negative impacts.




**Additional soil borings that we know have encountered subsurface water along the HDD pipeline route**

**Conclusions:**

As shown in the new information provided above and outlined in the previous filings to both DEQ on September 26,2017 and FERC on February 25, 2017 and again on May 4, 2017 (all are attached as part of this submittal), the steep slope areas around MP 158.7 & 158.9 warrant careful review by the Water Control Board prior to issuing the 401 certification. In the interest of getting this project approved, the ACP has not carefully studied the geologic conditions present in and around MP 158. Had the ACP presented all of the evidence to FERC and DEQ at the time of permitting, it would have triggered additional review/discussion about; the steep slopes, the unstable colluvial material, the large volume of groundwater present, the potential for debris avalanches, catastrophic damage to the headwaters of the Rockfish River, and the public safety concerns over the entrapment of an entire community. None of the evidence presented to date suggests there has been careful review of the existing conditions and the potential problems this project may cause to Virginia Water. As part of the 401 certification, the Commonwealth should force transparency of the engineering plans related to this project, and in doing, will greatly reduce the negative, and possibly catastrophic, consequences that could result from a lack of oversight.

As detailed in two separate letters included as part of this submission, The State Water Control Board and DEQ should consider the area around MP 158 as a High Consequence Area and require from itself and the ACP the level of scrutiny required under 49CFR192.905. The Code of Federal Regulations (CFR) was put in place to help prevent problems like those associated with projects in areas similar to those found around MP 158.7. The HDD project at the entrance to Wintergreen will penetrate a large ground water source that our community utilizes for drinking water production and fire protection. The HDD and the clearing and trenching of the pipeline rights of way will also greatly increase the risk of debris avalanche and the damage to surface waters that feed the Rockfish

cutting off all access to a community of over 2,500 residences. Debris avalanches located along these steep slopes could result in damage to the pipeline that triggers an explosion, rapidly spreading fire and a community unable to flee or receive help from outside agencies. Everything known about this project near MP 158.7 & MP 158.9 suggests the need for DEQ and the State Water Control Board to provide the additional environmental oversight that NWP 12 is incapable of providing.

As this project gets underway, more and more evidence is coming to light that, the "best practices" and "best in class" approach to pipeline construction is inadequate. Environmental disasters recently occurred on a Dominion project near Spartanburg SC and on the Mountain Valley Pipeline project in Franklin County VA. The news coverage of contaminated spring fed waters in Montgomery County VA and the pipeline explosion last week in Marshall County WV, should give additional cause for serious concern. The pipeline that exploded in Marshall County was put into service in January of this year and was described as "best in class" for safety, reliability, and efficiency by the company who built and is currently operating this brand-new pipeline. It is important to note that Dominion Energy regularly uses the phrase "best in class" to describe the construction, operation, and safety of the ACP. With failures mounting on similar projects, DEQ should recognize the need to scrutinize the engineering and construction plans more carefully and make sure the ACP is in fact constructed in a way that protects the citizens of Virginia and the water we depend on.

Sincerely,

Jay Roberts
Executive Director
Wintergreen Property Owners Association

Wintergreen Property Owner's Association
88 Wintergreen Drive
Roseland, Virginia 22967
Attn: Jay Roberts/Executive Director

**Discussion of the Atlantic Coast Pipeline in the Reeds Gap – Pond Hollow Headwaters Area, Nelson County, Virginia**

Since my visit to the Wintergreen area last summer and my letter to you dated 30 August 2017 summarizing my observations and concerns regarding the Atlantic Coast Pipeline (ACP) in the area around Route 664 and the access road to Wintergreen several additional studies were done.

1) Blackburn Consulting Services and Soil Foundation noted that the ACP failed to identify soils and landform hazards that are prone to debris-flow/landslides, and failed to provide plans that how to avoid and mitigate geologic issues over a large enough region.

2) Professional Engineer, Jim L. Taggart, noted that within one mile of this intersection, *and prior to final design*, this area should be declared a High Consequence Area where geological, hydrological, and soil studies are needed. He also noted the ACP should publish both the required Integrity Management Plan (IMP) and the required Baseline Assessment Plan, *prior to final design*. Finally he noted the necessity of identifying the geological faults in the material provided by Wintergreen as a *Time Independent Threat* - "prudently ensuring that this threat is properly considered in design and mitigation exercises for this area".

3) Lastly Wintergreen also provided LiDAR images that clearly show that multiple and recurrent landslides and debris-flows pose a serious natural hazard to the both ACP route and its alternate.

As I said in my previous letter, a tunnel within the granitic bedrock beneath the surficial colluvial deposits, would provide better protection to a pipeline. But neither the chosen ACP route nor its alternate are good locations because they both cross fault zones where the groundwater flow along these fault zones is obviously enhanced by hydrostatic pressure from the Devil's Knob-Potato Patch Mountain area downward toward route 664 producing artesian flow in at least one borehole. The best alternative for a tunnel would be approximately along the cross section line A-B shown on the map accompanying my previous letter. Along that line, southeastward from the Blue Ridge Parkway, a tunnel beneath the small granitic ridge (~0.1-0.2km east of A-B) is less likely to encounter artesian flow and could even be drained off laterally if necessary. The importance of maintaining the tunnel within the granitic bedrock until it goes beneath the Rockfish River and starts through or over Piney Mountain must be emphasized. Two major consequences of this suggested ACP-route adjustment and tunneling option are: 1) greater protection of water quality within this primary catchment area of the Rockfish River, and 2) significantly reduced risk of ACP-failure at or near the entrance to Wintergreen during or following the next time that a Hurricane Camille type of disaster occurs in this region.

Based on the stated facts above, the stark contrast obvious in the recent LIDAR mapping, and artesian ground water flow present along the HDD drill path, my continued recommendation is to move the pipeline far enough southeast so as to not encounter the problems above and not run the risk of an event that puts an entire community at risk.

Dr. Mervin J. Bartholomew
***North Carolina Licensed Geologist No. 583 (1987-2017)***

TCS Engineering Company, L.L.C.

Wintergreen Property Owners Association
Attn: Mr. Jay Roberts, Exec. Director
88 Wintergreen Drive, Wintergreen Resort
Wintergreen, VA 22967

Re: Atlantic Coast Pipeline placement near Rt. 664, Nelson County, Virginia

May 31, 2018

Mr. Roberts,
I am a resident of Nelson County, a Certified Firefighter in the County and a Virginia licensed practicing Professional Engineer in Virginia. This matter of the Atlantic Coast Pipeline is one in which I take more than passing interest.

I have worked professionally in, on, and around Wintergreen for more than 30 years. My specialty is Civil Site Design with concentration on Stormwater Hydrology. I am the author of the Master Stormwater Management Plan for the Wintergreen Mountain Community working closely with TJSWCD (the Agency tasked with Regulatory Approval of Stormwater Management and Erosion Control plans for the area).

It has come to my attention that the placement of the proposed Atlantic Coast Pipeline within Nelson County is currently proposed to extend beneath the Blueridge Parkway to a point near the Intersection of Wintergreen Drive and Rt. 664, proceeding eastward. I am writing to voice my opinion, not on the merits of the pipeline or lack thereof, but rather on the steps I urge be taken during the siting, design and construction of such a pipeline at or near this location.

My direct experience of structural interface with geologic conditions has been limited to a few residential pinnings (anchoring) projects securing footers against the predominant eastward dip along the east face of the Blue Ridge. Nonetheless, I have been consulted to informally review some geologic "developments" around the property. Typically, these instances entail slide areas and slips of roadways or embankments. Concerns to be sure, but generally speaking: situations where end-product failure is mitigatable.

Over decades of development, there has been born a body of knowledge which has taught the developers here that value assessment of any potential project must include careful consideration of underlying geology as well as hydrologic impacts both from surface hydrology and groundwater hydrology. Some of these lessons have been difficult as in the case of roadways along the Stoney Creek development and Tubing Park area failures. Some have been easy such as the early decision to effectively preclude development West of Wintergreen Drive between the Gatehouse and Fortunes Ridge; an area strikingly similar to the Pipeline Crossing location. Nevertheless, the crucial institutional knowledge at work within the boundaries of Wintergreen for several decades now REQUIRES that project placement first be vetted against the known and expected underlying geology. It would be

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difficult to argue that knowledge of such potential geologic impact here would be unexpected. The mere fact that underlying geology has, for so long, been known to affect site development projects should, according to Federal Regulations (49CFR195.108), require specific and detailed study of these known factors on the pipeline.

To that end, I urge that Wintergreen (in all its forms and organizations) request the developers of the ACP to:

1. Immediately and before design is finalized, Declare the areas within a minimum of 1 mile of the intersection of Wintergreen Drive and Rt. 664 in Nelson County, VA as High Consequence Area (HCA) (Basis: Class 3 Location due to Emergency Service Location, sole access to community, etc).
2. Publish the required Integrity Management Plan (IMP), again prior to design, for the entirety of the ACP but specifically within this HCA.
3. Within the IMP, Publish the required Baseline Assessment Plan IAW 49CFR192.905(c).
4. Specifically identify the Geologic faults identified in Wintergreen's provided Study material as a "Time Independent Threat (outside force damage) according to 49CFR192.917(3), prudently ensuring that this threat is properly considered in design and mitigation exercises for this area.

Federal Regulations have wisely required that these obvious matters be considered in placement of such a critical infrastructure. However, it is of concern that a hurried project schedule might push this critical matter to the status of an afterthought. It should be remembered here that much of the arguably critical need for this pipeline is as a regional or even National interest. The irony lies in the fact that if not properly designed, the lifespan of any resource may seriously underperform because of failure; potentially catastrophic failure. Logic would therefore conclude that, the more critical the need, the more robust the design should be.

The need or even the location, for this pipeline is a matter best argued in a different venue. The design protocol however is a matter for the here and now. I urge you to consider the affirmative steps listed above before the construction begins and resolve the potential complications early.

Sincerely,

Jimmy L. Taggart, P.E.
Virginia Registration No. 022841
741 Duncan Hollow Loop
Faber, VA 22938

Email: JTagg2@AOL.com

# ATTACHMENT #1

Wintergreen

88 Wintergreen Drive
Wintergreen Resort, VA 22967-2162

**Wintergreen Property Owners Association**

Jay W. Roberts, *Executive Director*
Tel. 434 325 8531 jayroberts@wpoainc.org

September 26, 2017

Department of Environmental Quality
P.O. Box 1105
Richmond, VA
c/o Hannah Zegler

RE: Atlantic Coast Pipeline ESC & SWM Plans, Nelson County VA

Ms. Zegler,

Please find enclosed a report on the bedrock geology associated with the Atlantic Coast Pipeline (ACP) where it crosses the Blue Ridge Parkway at approximately milepost 13 in Nelson and Augusta Counties. This report will prove valuable as the Department of Environmental Quality undertakes a review of erosion and sediment control (ESC) and storm water management (SWM) efforts related to the ACP.

The attached report is based on recent field survey work conducted by Dr. James Bartholomew. Dr. Bartholomew is an expert in bedrock geology and is the author of the VA Department of Mines and Minerals publication for the area in question. In addition to facts presented by WPOA and Dr. Bartholomew, many citizens have spoken out against the current Horizontal Directional Drill (HDD) path, the trenching up Piney Mountain and the alternative trenching route that runs up the side of Pond Hollow. The geology present in this area, the extremely steep slopes, prolific ground water, unstable colluvial material and the proximity of our communities only entrance and exit make this undertaking extremely dangerous with a very high likelihood of slope failure.

As DEQ studies the ESC and SWM construction plans submitted by ACP, please include Dr. Bartholomew's report as part of this DEQ review. A careful study of this report and the geology of this region will show multiple documented places where landslides have occurred in and around Wintergreen. It is extremely important for DEQ to consider the science, the historical slope failure data, and the safety implications to our community as it considers the ESC and SWM requirements.

Sincerely,

Jay Roberts
Executive Director
Wintergreen Property Owners Association

Encl.

# ATTACHMENT

# #2

Wintergreen

88 Wintergreen Drive
Wintergreen Resort, VA 22967-2162

**Wintergreen Property Owners Association**

Jay W. Roberts, *Executive Director*
Tel. 434 325 8531 jayroberts@wpoainc.org

**February 25, 2017**

**Ms. Kimberly D. Bose, Secretary**
**Federal Energy Regulatory Commission (FERC)**
**888 First Street, NE**
**Washington, DC 20426**

**Re: Docket No. CP15-554-000; Response to the FERC DEIS on the ACP**

**Dear Ms. Bose:**

**This letter is submitted by the Wintergreen Property Owners Association (WPOA) in response to the FERC Notice of Availability of the Draft Environmental Impact Statement for the Proposed Atlantic Coast Pipeline (ACP) issued on 30 December 2016. The DEIS requested comments be submitted from intervenors by 6 April 2017. The Wintergreen Property Owners Association registered as an intervenor on October 4, 2015 and filed its first protest on 11 December 2015.**

**Please find enclosed a recent report on bedrock geology associated with The Atlantic Coast Pipeline where it crosses The Blue Ridge Parkway in Virginia at approximately milepost 13. The DEIS does not adequately address the construction concerns and high likelihood of catastrophic slope failure given the known geology of this area. The area is known locally as "Pond Hollow" and/or "Reeds Gap".**

**The attached report and map were based on a recent field survey by geologist Dr. Jerome Bartholomew. Dr. Bartholomew originally mapped the geology of the Sherando quadrangle as part of his doctoral thesis. Both his published maps and a complete report resulting from that work remain the official document used by Virginia's Department of Mines and Minerals. A copy of the state publication is also enclosed.**

**Dr. Bartholomew's published work and resume (also attached) include many, many relevant published studies completed on sites with geology similar to this area of Virginia's Blue Ridge and he currently consults and teaches at The University of Memphis in Tennessee. His early work in Virginia coincided with the August 1969 Hurricane Camille event where he witnessed catastrophic slope failure associated with colluvial deposits in Nelson, one of which is directly in the proposed Atlantic Coast Pipeline path. Subsequently and much more recently the adjacent community of Wintergreen has witnessed three similar events along the same geologic formation in the same area. These dangerous and costly failures were on engineered sites, fortunately, none of these resulted in loss of life.**

**Given the local geology, a recently engineered site for a 5 million gallon water tank was abandoned and a new site was selected.**

**It is important for FERC to understand that Wintergreen has learned from its mistakes. It is dangerous to excavate colluvial deposits, especially those that overly southeast dipping bedrock as is the case in the proposed pipeline route. Water perking through fault zones into adjacent colluvial material greatly enhances the danger of landslides even without a catastrophic rain event. A tunneled pipeline effort through the mountain would breach four of these faults (one of which incorporates a shear zone) likely channeling the water flow into overlying colluvial material.**

**We have watched Dominion Power responsibly reroute the pipeline around wetlands, historic structures, and municipal areas. As we continue to study Dr. Bartholomew's report and continue to use Lidar and other new technology available to us, we are at a loss as to explain why a high pressure 42 inch pipeline route is currently engineered to disturb a potentially catastrophic landslide area. In the event of slope failure and any potential related explosion, Wintergreens police offices, 911 command center and the community's administrative offices would likely experience destruction and loss of life. In addition, the Wintergreen community's only entrance and exit would be blocked by the resulting debris avalanche and/or a fire. To further this point, Virginia recently retired state forester describes his concerns in a separate letter enclosed. When considered objectively, the potential risks to human life of this route are real and well supported by science.**

**The FERC DEIS issued on December 30th 2016, makes no mention of bedrock geology, the shear zone, faults, colluvial material, recent slope failures and many other challenges that must be overcome to protect the people who work in or must pass through Pond Hollow. WPOA objects to the ACP on multiple grounds, however, in this request we ask FERC to focus attention on Dr. Bartholomew's work. The current path of the ACP through Pond Hollow represents a genuine risk to the Wintergreen Community and other landowners in the area.**

**Respectfully,**

**Jay Roberts**
**Executive Director**
**Wintergreen Property Owners Association**

Wintergreen Property Owner's Association
88 Wintergreen Drive
Roseland, Virginia 22967
Attn: Jay Roberts/Executive Director

**The Reeds Gap – Pond Hollow,**
**Debris-Avalanche/Debris-Flow Collection Basin,**
**Nelson County, Virginia**

Some classic and very expensive induced landslide-failures in Virginia (e.g., along I-81 near Hollins, Roanoke Co.; along I-81 near Dixie Caverns, Montgomery Co.; and along I-64 near Afton Mountain, Albemarle, Co.) should not have happened! Although geotechnical work may have been of high quality along the actual right of ways, the geological mapping and broader assessment of the surrounding areas should have been one of the required necessary and sufficient conditions needed to demonstrate that failure was likely. Thus, stretches of these highways could have been relocated without disastrous results.

On a recent visit to the Reeds Gap – Pond Hollow area in Nelson Co., it was apparent that some geotechnical work (as indicated by cuttings at some shallow boreholes) had been done along a narrow proposed pipeline route across the collection basin. This was near a debris-avalanche chute (Figure 1) that crossed VA highway 664 near Reeds Gap. In 1969 I observed the 7-10m-high mud ring on trees that lined this chute. I also observed that this debris avalanche stopped about 0.5 km down the mountain where the gradient flattened in the catchment basin. I mapped the geology around Wintergreen (Bartholomew, 1971). I located and logged some of the first water wells along the sheared granite/greenstone contact (Figure 1) drilled on top of the mountain at Wintergreen (1971-1973). Later I published the Sherando and Greenfield quadrangles (Bartholomew, 1977) where I mapped many of the debris avalanche chutes and later analyzed some of the contributing factors that produced more than 1100 debris avalanches during Hurricane Camille (Gryta and Bartholomew, 1987 and 1989).

Being on the perimeter of the high rainfall area during Hurricane Camille, the Wintergreen area received only a few debris-flows/debris-avalanches and only one occurred within the collection basin. Still that slide was triggered along the contact (Figure 1) between Catoctin Greenstone and a weathered, thin phyllitic metasediment with a gently dipping foliation. This contact is very similar to the contact between Catoctin Greenstone and a thick, weathered phyllite that generated the Afton Mountain slide along I-64 near Royal Orchards as well as similar contacts in the Wintergreen area.

Thus, when I observe minimal geological and/or geotechnical work being done in an area where repeated debris-flows/debris-avalanches are known to have occurred, I am concerned because I know that high-rainfall events like Camille will happen again and again! Indeed, in a recent study (Soplata, Bartholomew, and Wooten, 2016) along Hickory Nut Gorge near Chimney Rock, North Carolina, a Camille-type event killed seven people and triggered about 300 debris avalanches in 1916. Major flooding occurred in 1994, 1996, 2008, and 2014. The 1996 rainfall event triggered a mudslide that pushed a house 150 feet down the slope of the gorge (just 80 years after the 1916 event). Thus major rainfall events do not need a Camille-type storm to trigger landslides. Even moderate rainfall and groundwater movement along faults and shear zones, bedding contacts, foliation planes and joints can trigger landslides as witnessed by the tubing-park slope failure at Wintergreen and the subsequent decision to move the water tank because of it.

While Wintergreen was in its nascence, I recommended that the Pond Hollow access road not be used as the principal access route to Wintergreen because of the high risk that the Reeds-Gap/Pond-Hollow collection basin possesses from repeated debris-flows/debris-avalanches. Although the road was essential to gain access to the mountain, Wintergreen did follow a policy that residential homes were not built along this roadway (Wintergreen Drive). By avoiding residential development in the basin, only people driving up or down the mountain are at risk from major rainfall events. The Police Emergency and Command Center (Figure 1) was placed at junction of VA Highway 664 and Wintergreen Drive to have a staging area for emergency deployment to the mountain. The administration building for the Wintergreen Property Owners Association is located nearby as well as several maintenance buildings, but none of these are residences.

My concern was magnified many times over when I recently visited and walked the route of the proposed pipeline and learned of the intention to put a large, high pressure gas pipeline across the funnel of the tracks of many debris-flows/debris-avalanches. Considering the size of many very large boulders in past debris flows and the sheer weight and size of these debris flows, a gas pipeline is not safe a safe structure to install on the surface of the ground nor within surficial debris-flow deposits in this catchment area. The debris-flow/debris-avalanche deposits in the collection basin are relatively shallow and a Camille-type rainfall event centered on this collection basin could literally "pull the plug" and all of the deposits could be swept down the funnel scouring the base of the granite floor with debris tracks!

A tunnel bored within the granite bedrock beneath the surficial colluvial deposits, would provide better protection to a pipeline (Figure 1). But considerable care must be exercised because SE-dipping lithologic contacts, SE-dipping faults and shear zones, and a strong SE-dipping foliation all favor weathering and groundwater movement down-slope toward and into the collection basin. The proposed pipeline actually crosses a SE-dipping thrust fault that places highly sheared granitic gneiss over top of highly sheared metasediments of the Swift Run Formation. Foliation in this ~30m-thick shear zone dips SE and is likely to be a major conduit along which groundwater moves. Additionally, downhill from the thrust fault, two high-angle faults likely cross this proposed pipeline. Along one of these two faults, two water wells were drilled along the contact between sheared granite and the greenstone to depths of ~200 feet (Figure 1). The shear zone in the granite was ~50 feet wide. These fault zones are also groundwater conduits. As was the case with the tubing-park slope failure at Wintergreen, enhanced groundwater along a lithologic contact toward a shear zone promoted weathering and contributed to slope failure. Problems with construction of the water tank at Wintergreen were also linked to deep weathering of the Catoctin Greenstone and joint-sets within the greenstone that promoted oxidation and deeper weathering near the fault zone.

I have spent many years studying the sequence and relationships among different fracture sets to aid in the understanding how groundwater flows through fracture systems (Bartholomew and Rich, 2012; Bartholomew and Van Arsdale, 2012; Bartholomew et al., 1994, 1998, 2000, 2002, 2007, 2009; Evans and Bartholomew, 2010) in crystalline rocks of the Appalachian Piedmont, Mesozoic Basins, and Coastal Plain sediments, in part related to multi-year studies around the DOE Savannah River site (Bartholomew et al., 1995, 1996, 1997) and the "North Carolina low-level radioactive waste disposal facility project" (Bartholomew and Fleischmann, 1993; Wooten et al., 2001). Any tunnel across the collection basin needs to be concerned that groundwater flow within shear zones, along lithological contacts and faults, and through fracture sets is not altered or redirected in ways that might enhance slope failures.

Detailed geological mapping around the Reeds Gap-Pond Hollow collection basin should follow standard practices in the collection and analysis of data, such as was done by Law Engineering, Inc. and Harding Lawson

Associates in the multi-year assessments of the "North Carolina low-level radioactive waste disposal facility project" for Chem-Nuclear Systems, Inc. in the 1990s. The procedures for mapping, trenching, coring, groundwater studies, and geophysical investigations need to be standardized and rigorously applied so that concerns for human safety are constantly maintained. For this and other projects, I have coordinated teams of 2-9 people for geological work. The NC project required more than 4000 feet of trenching with careful mapping of soils, bedrock lithology, and structural features and public walk-throughs of the trenches where people can ask whatever questions they feel are relevant. Such procedures insure public confidence in the work. Future studies near Reeds Gap should include such things as Lidar, coring, OSL and $^{14}C$ dating, and geophysical work coupled with mapping of surficial deposits. Using such techniques can help avoid costly mistakes.

Because this location is the only entrance and exit for both security and administrative buildings as well as for the larger community, the current route is inadvisable and the risk of failure is high. I recommend that the pipeline be relocated and not be placed across this collection basin where the geologic factors indicate greater concern for public safety.

Dr. Mervin J. Bartholomew

***North Carolina Licensed Geologist No. 583 (1987-2017)***


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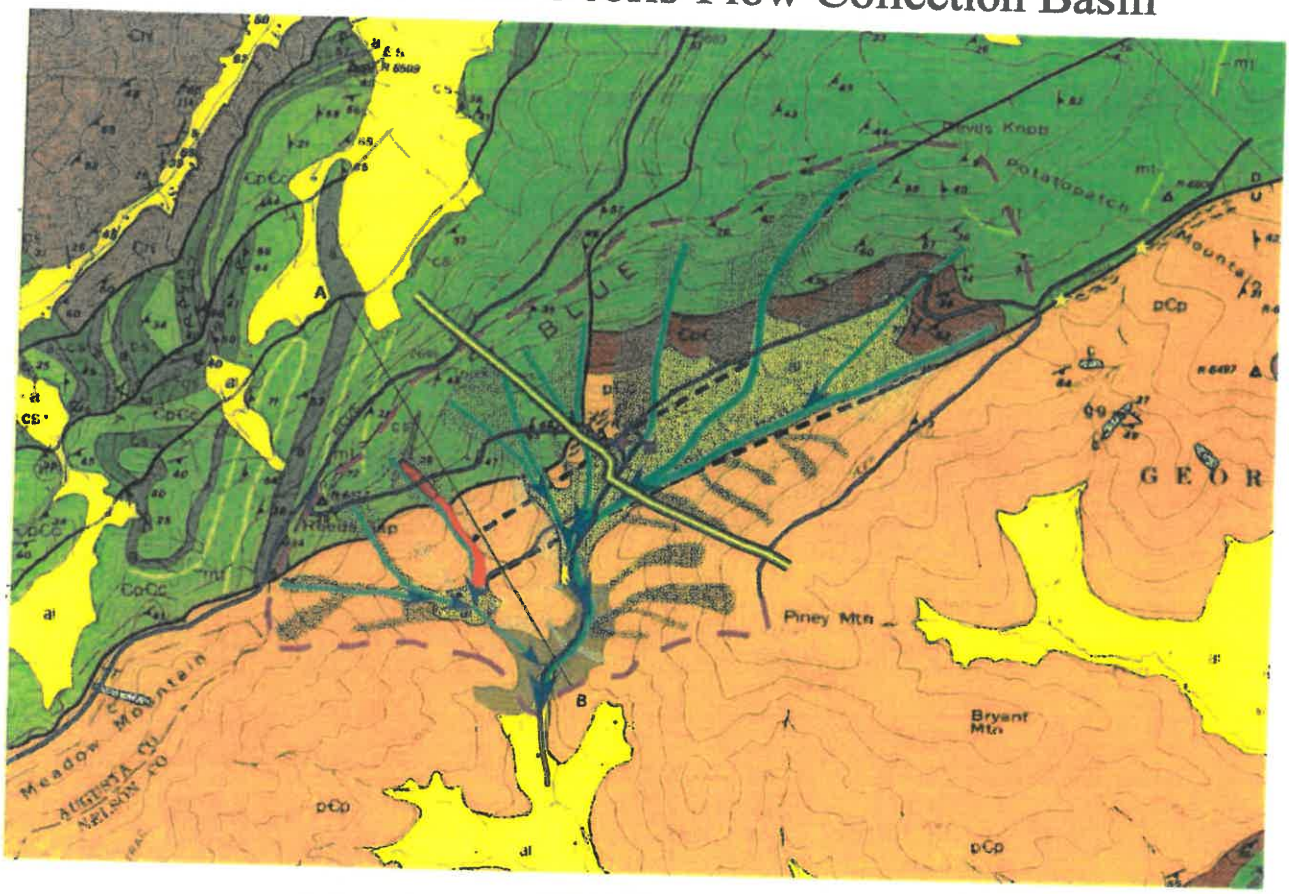
# The Reeds Gap - Pond Hollow
# Debris-Avalanche/Debris-Flow Collection Basin




SCALE 1:24000

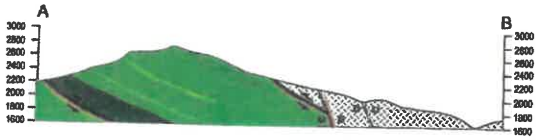
1 MILE 0

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER 0 1

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

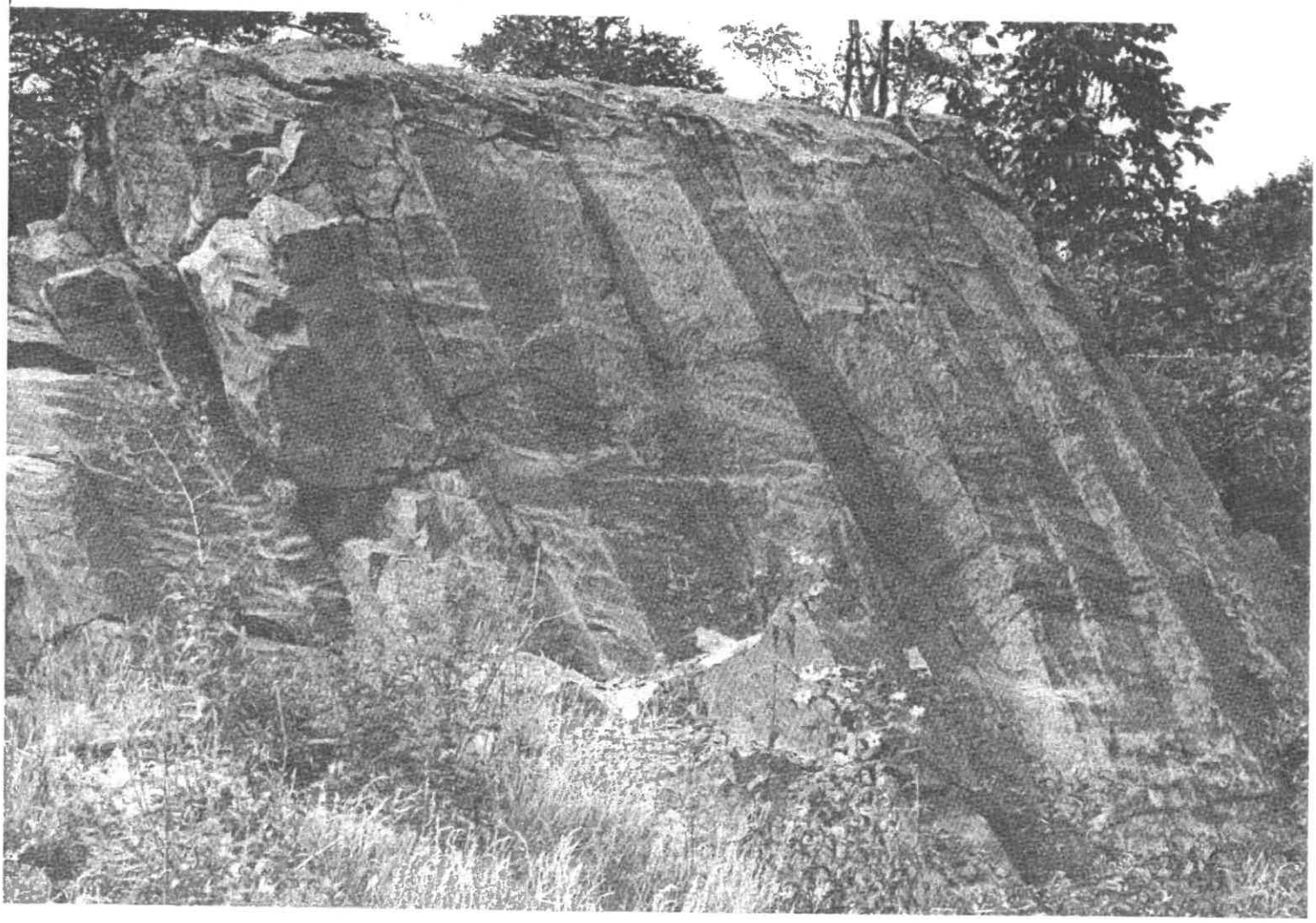
- Approximate Road
- Police Emergency and Command Center
- Wintergreen Property Owners Association Building
- Postulated Pipeline Across Flow Funnel (not geologically assessed)
- Water Well
- 1969 Camille Chute
- 1969 Camille Track
- Prehistoric Deposits
- Prehistoric landslides
- Incised Channel Across Granitic Rocks
- Debris-Flow Direction
- Debris-Flow Collector Basin Divide



VIRGINIA DIVISION OF MINERAL RESOURCES PUBLICATION 4

# GEOLOGY OF THE GREENFIELD AND SHERANDO QUADRANGLES, VIRGINIA

MERVIN J. BARTHOLOMEW



COMMONWEALTH OF VIRGINIA

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES

James L. Calver, Commissioner of Mineral Resources and State Geologist

CHARLOTTESVILLE, VIRGINIA

1977

CONTENTS

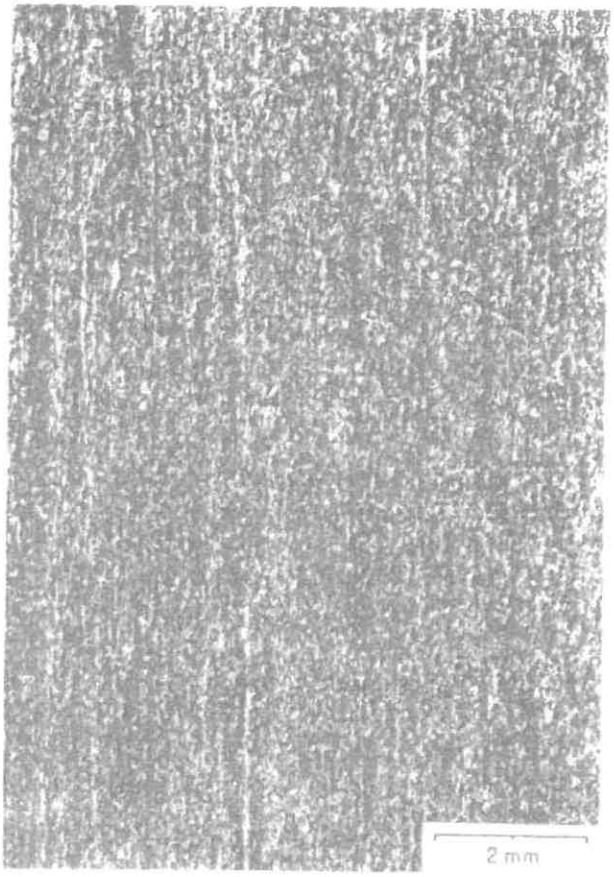



Figure 31. Photomicrograph of a blastomylonite layer (R-6793) within interlayered mylonitic gneiss and schist from the cataclastic rocks; subparallel biotite and muscovite foliations are vertical.

## QUATERNARY SYSTEM

### Terrace Deposits

Extensive terrace deposits are found in Rockfish Valley (Plates 1, 2) and in Sherando valley west of Back Creek (Plate 2). In Sherando valley the younger alluvium was not differentiated from terrace deposits; the valley is covered by poorly sorted quartzite cobbles and boulders in a brown to reddish-brown, poorly sorted, loosely compacted matrix of sand, silt, and clay. Knechtel (1943) shows that the depth of unconsolidated material ranges from 15 to 150 feet (5 to 46 m) near the abandoned Lyndhurst and Mount Torry tract mines. This broad plain, covered with terrace material, is part of a bajada that extends west-southwestward from Sherando for about 15 miles (24 km) along the foot of the Blue Ridge to the vicinity of Vesuvius (Werner, 1966, his Plate 1). In the vicinity of the Lyndhurst mine east of Back Creek several small dissected terrace deposits are also present. These deposits probably developed contemporaneously with the bajada and differ only in that a large portion of the detritus was of local origin derived from the mountains to the west.

In Rockfish Valley a well-dissected bajada is also present at elevations from 10 to 40 feet (3 to 12 m) above the present drainage. This feature consists mainly of confluent alluvial fans that were formed by the formerly eastward-draining Stony, Little Stony, and Spruce creeks. Allen Creek and other nearby small creeks are abandoned channels cut into the bajada by Stony and Little Stony creeks when they formerly drained eastward. The bajada extends as far north as Meriwether Creek, and a similar dissected *alluvial* slope is found along and north of Goodwin Creek. Detrital material on the bajada reflects the local derivation of detritus. Pebbles, cobbles, and boulders of quartz, granite, gneiss, and greenstone dominate the clasts in a brown to reddish-brown matrix of sand, silt, and clay. Except locally the thickness of these terrace deposits seldom exceeds 10 feet (3 m).

### Alluvium

Alluvium includes flood-plain and mountain-stream deposits. Flood-plain deposits are present along Rockfish River, Back Creek, and the lower parts of most of their tributaries. They generally consists of light- to medium-brown, pebbly or gravelly sand and silt and locally contain cobbles and boulders. Flood-plain detritus similar to terrace deposits reflects the local origin of the material. Mountain-stream deposits are present along all high-gradient perennial and intermittent streams in both quadrangles. These deposits consist of loosely piled boulders and cobbles with lesser amounts of pebbles, sand, silt, and clay of local origin. Debris-avalanches are believed to be the principal transporting mechanism for much of the material in mountain stream deposits.

### Landslide Areas

In 1969 extensive debris-avalanches, landslides, and flooding in the Tye and Rockfish river basins caused extensive material damage and loss of human life. In the 1969 catastrophe most damage was attributed to a torrential rainfall (numerous accounts report more than 27 inches in less than 8 hours during the night of August 19-20) that accompanied Hurricane Camille during its east-northeastward movement across Virginia. The Sherando and Greenfield quardangles are on the northern fringe of the severely devastated region (Virginia Division of Mineral Resources, 1969; Webb, Nunan, and Penley, 1970), and as such they were not as seriously affected as regions to the south. Within the Sherando quadrangle, numerous small landslides occurred, primarily along roadcuts and other steep

slopes in the Rockfish Valley, along the Blue Ridge Parkway, and along many jeep trails and stream valleys in the mountains in the southern half of the quadrangle. Within the more devastated region to the east debris-avalanche chutes were developed in the southeastern part of the Greenfield quadrangle in soil and saprolite of the Lovingston Formation and layered granulite gneiss in about 100 steep ravines (Plate 1). By contrast, only 13 debris-avalanche chutes were formed in the southern part of the Sherando quadrangle (Plate 2). Seven of these chutes were developed in soil and saprolite of Pedlar charnockite (Figure 17 and road log cumulative miles 61.4). Five chutes (road log cumulative miles 54.70) and one landslide were formed in saprolite of the Catoctin and Swift Run metasediments, and one in saprolite of granulite gneiss. Unique chutes developed on the Swift Run and Catoctin metasediments. In all six chutes in these rocks the slide material detached along southeastward-dipping foliation surfaces, which in three instances were subparallel to dip-slope bedding. In most cases, the metasedimentary saprolite transmitted ground water beneath unweathered or slightly weathered greenstone causing the detachment of a large mass of material consisting mainly of greenstone blocks with or without blocks of fresher metasedimentary material. The potential for this kind of detachment is great on all steep, southeastward-dipping slopes underlain by the Catoctin and Swift Run formations.

## METAMORPHISM

Two distinct, contrasting periods of metamorphism are easily recognizable in the Precambrian rocks of the Blue Ridge core whereas only one period of metamorphism affected the upper Precambrian(?) and overlying lower Paleozoic rocks. The earlier period is generally correlated with metamorphism of the Grenville province of Canada, and it is therefore commonly referred to as "Grenville metamorphism" (Espenshade, 1970; King, 1970; Rodgers, 1972). In the Blue Ridge of Virginia, Grenville metamorphism is characterized by widespread massive charnockite associated with layered granulite gneiss. The younger period of polyphase Paleozoic metamorphism, however, only reached lower-greenschist to lower-amphibolite facies in this region.

### PRECAMBRIAN (GRENVILLE) METAMORPHISM

Grenville metamorphism in this part of Virginia was characterized by prograde metamorphism of quartzofeldspathic rocks to the granulite facies, more or less coincident with emplacement of extensive biotite-bearing granitic and charnockitic plutons. As a result of Paleozoic thrusting, rocks of the eastern (Lovingston) massif were thrust over rocks of the western (Pedlar) massif. Thus, within the confines of the Sherando and Greenfield quadrangles some differences in metamorphism exist between rocks on opposing sides of the zone of cataclastic rocks that now separates the two massifs. The massive, biotite-bearing granitic gneiss (Lovingston Formation) of the Lovingston massif is cut by only a few small intrusions of massive charnockite, whereas the Pedlar massif is primarily massive charnockite with no biotite granitic gneiss. Thus, the Lovingston massif probably represents a higher crustal level than the Pedlar massif.

In general, the layered granulite-gneiss of the Pedlar massif is evidence for a slightly deeper crustal level (higher grade) of metamorphism than that of the Lovingston massif for the following reasons: (1) segregation layering is better developed in gneiss of the Pedlar massif (Figures 2, 6); (2) contacts between individual layers and rock types are much sharper and better defined (Figures 2, 5, 16); (3) anatexis of the Cooks Hollow dome appears to have progressed farther than that of the Pilot Mountain and Ennis Mountain roof pendants, and (4) garnet, indicative of higher pressure (Saxena, 1968), is widespread throughout the western massif (Plates 1, 2), but it is generally lacking in the eastern massif except for a few scattered outcrops in rocks within and near the cataclastic zone (R-6496). Grenville mineral assemblages are shown in Table 3.

### PALEOZOIC METAMORPHISM

All rocks southeast of the Back Creek fault were regionally metamorphosed progressively from lower-greenschist facies on the west (Sherando quadrangle) to upper-greenschist and lower-amphibolite facies on the east (Greenfield quadrangle). Extensive cataclasis and thrusting of the Lovingston massif over the Pedlar massif along the Rockfish Valley fault took place more or less concurrent with polyphase Paleozoic metamorphism that produced the prominent northeastward-trending axial-plane foliation in the folded Catoctin and younger rocks (Figure 23) and the northeastward-trending blastomylonitic fluxion structure in the cataclastic rocks and Lovingston mylonitic gneiss. Fullagar and Dietrich (1976, p. 358-359) place a Rb-Sr age of 520-583 million years on this period of metamorphism.

Continued metamorphism produced lower oxidation state assemblages, indicative of a slight increase in metamorphic grade, more or less coincident with the formation of a secondary crinkle foliation in the Catoctin metavolcanics. The various metamorphic mineral assemblages are shown in Tables 4 and 5. The

*RESUME*

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## EDUCATION

Ph.D. 1971, *Virginia Polytechnic Institute & State University*, Blacksburg, Virginia

M. S. 1969, *University of Southern California*, Los Angeles, California

B. S. 1964, *The Pennsylvania State University*, University Park, Pennsylvania

## EXPERIENCE

- 2002-2017: **Professor;** served as **Chair** (FY03-14), *Department of Earth Sciences*, University of Memphis, Memphis, Tennessee; **Instructor** (summers 02-13) for YBRA/Penn-YBRA/Houston geology field camps: Yellowstone-Bighorn Research Association, Red Lodge, MT
- 1992-2002: **Research Professor,** Earth Sciences and Resources Institute; served as **Program/ Graduate Director** (FY94-01), *Master of Earth & Environmental Resources Management Program*, School of the Environment, University of South Carolina, Columbia, South Carolina
- 1983-1992: **Professor/Associate Professor**; served as **Chief** (FY83-85; FY87-90), *Geology & Mineral Resources Division*, Montana Bureau of Mines & Geology, Montana Tech of the University of Montana, Butte, Montana
- 1979-1983: **Geologist-in-charge,** Virginia Tech (Blacksburg) office, Virginia Division of Mineral Resources, P.O. Box 3667, Charlottesville, Virginia
- 1976-1979: **Contract/WAE Geologist,** Virginia Division of Mineral Resources P.O. Box 3667, Charlottesville, Virginia
- 1975-1980: **Contract Geologist,** North Carolina Division of Land Resources, Raleigh, North Carolina
- .1972-1975: **Assistant Professor,** Department of Geosciences, North Carolina State University, Raleigh, North Carolina
- 1971-1972: **Instructor**, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Earlier Experience

- 3 years: Standard Oil Company of California (CHEVRON), western Los Angeles basin (Inglewood District), California
- 4 years: geologic consultant for planning & developmental phases for 4612-unit Wintergreen recreational community in Virginia Blue Ridge: *Virginia Landmark Corporation, Richmond, VA; Cabot, Cabot & Forbes Company, Boston, MA; Dufresne-Henry Engineering Corporation, North Springfield, VT; C C & F Wintergreen, Inc., Wintergreen, VA;* Invited for 10 May 2008 dedication of Wintergreen Founders Vision Overlook on the Blue Ridge Parkway by Wintergreen Nature Foundation
- 1 field season: Los Angeles County Museum, California
- 1 field season: Atlantic-Richfield Oil Company (ARCO), California
- 1 field season: Central Savannah River Area Project, University of Georgia, Georgia
- 1 field season: Tennessee Copper Company, Alabama/Georgia

## PROFESSIONAL ACTIVITIES

**Special Conferences and Sessions**

2017 Co-organizer & Session Co-chair, SE section meeting Geological Society of America, Richmond, VA

2012 Field Trip Co-Chair, National Annual Meeting, Geological Society of America, Charlotte, NC

2001 Co-organizer & Session Co-chair, Proterozoic Tectonic Evolution of the Grenville Orogen in Eastern North America, Topical Session T2-I & II, Annual Meeting, Geological Society of America, Boston, MA

1997 Organizer & Session Co-chair, Interdisciplinary characterization of major, environmentally sensitive sites, SE USA, Symposium 10-I, II, & III, SE Section meeting, Geological Society of America, Auburn, AL

1995 Co-organizer & Session Co-chair, Fracture Development, Reactivation, and Mineralization Session, 12th International Conference on Basement Tectonics, Norman, OK

1988 Organizer & General Chair, 8th International Conference on Basement Tectonics, Butte, MT

1982 Organizer and Session Co-chair, Symposium on Grenville Terranes of the Appalachians, (Parts I & II) joint NE/SE Sections meeting, Geological Society of America, Washington, DC

1988 Session Chair, SE section meeting Geological Society of America, Columbia, SC

1988 Session Chair, Montana Mining Association, Butte, MT

1987 Session Chair, 7th International Conference on Basement Tectonics, Kingston, Ontario

1988 Geohazards 88, U. S. Geological Survey, Menlo Park, CA

1988 Research Applications workshop, National Earthquake Hazards Reduction Program, Denver, CO
1987 Penrose Conference, construction and balancing of geologic cross sections, Rosendale, NY
1986 IGCP Project 233 - International Conference on Iberian Terranes, Oviedo, Spain
1981 Basement and Basement-Cover Symposium, Uppsala Caledonide Symposium, Uppsala, Sweden

**Field Trips**

2016 Coleader, 50th Annual Field Trip, Georgia Geological Society, Jekyll Island, GA
2012 Principal leader, field trip #415 for National Annual Meeting, Geological Society of America, Charlotte, NC
2009 Principal leader, Carolina Geological Society, Columbia, SC
2008 Principal leader, field trip # 2, Tobacco Root Geological Society, Red Lodge, MT
2007 Coleader, field trip #425 for National meeting, Geological Society of America, Denver, CO
2007 Principal leader, field trip #2 for SE section meeting, Geological Society of America, Savannah, GA
2001 Coleader, field trip #3, SE section meeting, Geological Society of America, Raleigh, NC
2000 Principal leader, field trip #3, SE section meeting, Geological Society of America, Charleston, SC
1998 Coleader, field trip, Carolina Geological Society, Columbia, SC
1994 Principal leader, field trip #6, SE Section meeting, Geological Society of America, Blacksburg, VA
1993 Principal leader, Appalachian Tectonic Studies Group field conference, Christiansburg, VA
1991 Principal leader, field trip #3, joint NE/SE Sections meeting, Geological Society of America, Baltimore, MD
1990 Coleader, field trip, Friends of the Pleistocene, Ennis, MT
1989 Leader, trip #2, Tobacco Root Geological Society, Dillon, MT
1989 Stopleader, field trip T380, International Geological Congress, Dillon, MT
1987 Coleader, field trip, Rocky Mountain Section, American Association of Petroleum Geologists, Boise, ID
1983 Principal leader, field trip, Carolina Geological Society, Boone, NC
1982 Principal leader, Field Trip #6, joint NE/SE Sections meeting, Geological Society of America, Washington, DC
1982 Coleader, field trip, Virginia Oil and Gas Conference, Roanoke, VA
1980 Coleader, field trip #6, National meeting, Geological Society of America, Atlanta, GA

**Professional Societies:** Geological Society of America (*Fellow*, 1982-2016); American Geophysical Union (*Life Member*); Yellowstone-Bighorn Research Association (Board member; 2007-2015); International Basement Tectonics Association, Inc.; International Association of Structural/Tectonic Geologists; Appalachian Tectonic Studies Group; Tobacco Root Geological Society (1991 & 1992 *Vice-President*); Central Savannah River Area Geological Society (*Charter Member;* 1993-95 *Advisory Board*); Carolina Geological Society (*Life Member*); Montana Geological Society; Society for Pennsylvania Archaeology (*Life Member*).

## BOOKS

1. Eppes, M.C., **Bartholomew, M.J.**, editors, 2012, ***FROM THE BLUE RIDGE TO THE COASTAL PLAIN: FIELD EXCURSION IN THE SOUTHEASTERN U.S.***: *Geological Society of America Field Guide* 29, Boulder, Colorado, 395p.
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4. **Bartholomew, M.J.**, Hyndman, D.W., Mogk, D.W., Mason, R., editors, 1992, ***BASEMENT TECTONICS 8: CHARACTERIZATION AND COMPARISON OF ANCIENT AND MESOZOIC CONTINENTAL MARGINS-- Proceedings of the Eighth International Conference on Basement Tectonics, held in Butte, Montana, USA, August, 1988***: Kluwer Academic Publishers, Dordrecht, The Netherlands, 745p.
5. **Bartholomew, M.J.**, editor, 1984, ***THE GRENVILLE EVENT IN THE APPALACHIANS AND RELATED TOPICS***: *Geological Society of America Special Paper 194*, Boulder, Colorado, 287p.

## PUBLICATIONS (Active Tectonics, Cenozoic & Environmental Geology)

- **ACTIVE FAULTS, SEISMICITY, EARTHQUAKE HAZARDS**

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2. **Bartholomew, M.J.**, Rich, F.J., 2012, Pleistocene shorelines and coastal rivers: Potential sensitive indicators of Quaternary tectonism along the Atlantic Coastal Plain of North America, p. 17-36 in Cox, R.T., Tuttle, M.P., Boyd, O.S., Locat, J., editors, ***Recent Advances in North American Paleoseismology and Neotectonics East of the Rockies:*** *Geological Society of America, Special Paper* 275p. doi:10.1130/2013.2493(02).**Bartholomew, M.J.**, Van Arsdale, R., 2012, Structural controls on intraplate earthquakes, U.S.A., p. 165-189 in Cox, R.T., Tuttle, M.P., Boyd, O.S., Locat, J., editors, ***Recent Advances in North American Paleoseismology and Neotectonics East of the Rockies:*** *Geological Society of America, Special Paper* 493, 275p. doi:10.1130/2013.2493(08).
3. Feng, C., Li, D., **Bartholomew, J. M.**, Luo, W., 2012, Characteristics and patterns of surface ruptures caused by the Yushu earthquake: *Geotectonica et Metallogenia*, V. 36, no. 1, p.69-75.
4. Mickelson, A. M., **Bartholomew, M.J.**, Chapman, A., Sease, R., 2011, Paleoseismites which formed prior to and during the 31 August 1886 Charleston earthquake in colonial Dorchester, South Carolina: *Southeastern Geology*, V.48, no.3, p.129-146.

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25. Secor, D.T., Jr., Barker, C.A., Gillon, K.A., Mitchell, T.L., **Bartholomew, M.J.**, Hatcher, R.D., Balinsky, M.G., 1998, A field guide to the geology of the Ridgeway-Camden area, South Carolina Piedmont, p.71-83 *in* D.T. Secor, Jr., editor, ***1998 Special Issue devoted to the 1998 Field Trip for the Carolina Geological Society***: *South Carolina Geology*, V.40, 83p.
26. **Bartholomew, M.J.**, Fleischmann, K.H., Wilson, J.F., 1994, Structural features associated with the Jonesboro fault where it crosses U.S. Highway 70, Wake County, North Carolina, p.69-74 *in* E.F. Stoddard, D.E. Blake, editors, ***Geology and Field Trip Guide, Western Flank of the Raleigh Metamorphic Belt, North Carolina,*** *Carolina Geological Society Field Trip Guidebook 1994*: North Carolina Geological Survey, 110p.

- **RIVER /LANDSCAPE EVOLUTION, LANDSLIDE HAZARDS, VOLCANIC ROCKS, GEOMORPHOLOGY**

27. Derkey, R.E., Watson, S. M., **Bartholomew, M.J.**, Stickney, M.C., Downey, P. J., 2004, Geologic map of the Deer Lodge area with text on the geology of the Deer Lodge area, Deer Lodge and Powell counties, Montana by Derkey, R.E., **Bartholomew, M.J.**: *Montana Bureau of Mines and Geology, Open-File Report: MBMG 271*, 1:48,000-scale map with 23 p. pamphlet.
28. **Bartholomew, M.J.**, Lewis, S.E., Russell, G.S., Stickney, M.C., Wilde, E.M., Kish, S.A., 1999, Late Quaternary history of the Beaverhead River

canyon, southwestern Montana, p. 237-250 *in* S.S. Hughes, G. D. Thackray, editors, ***Guidebook to the Geology of Eastern Idaho***: Idaho Museum of Natural History, 350p.

29. Schultz, A.P., **Bartholomew, M.J.**, Lewis, S.E., 1991, Surficial Geology and SLAR image of the Radford (0° 30' x 1° 00') quadrangle, Virginia-West Virginia: *U.S. Geological Survey, I Map, I-2170 A* (1;100,000-scale map with text).
30. **Bartholomew, M.J.**, Mills, H.H., 1991, Old courses of the New River: its late Cenozoic migration and bedrock control inferred from high-level stream gravels, southwestern Virginia: *Geological Society of America, Bulletin*, V.103, No. 1, p. 73-81.
31. Gryta, J.J., **Bartholomew, M.J.**, 1989, Factors influencing the distribution of debris avalanches associated with the 1969 Hurricane Camile in Nelson County, Virginia, p. 15-28 *in* A.P. Schultz, R.W. Jibson, editors, ***Landslide Processes of the Eastern United States and Puerto Rico***: *Geological Society of America, Special Paper 236*, 102p.
32. Derkey, P.D., **Bartholomew, M.J.**, 1988, Geologic map of the Ramsay quadrangle, Silver Bow County, Montana: *Montana Bureau of Mines and Geology, Geologic Map Series, No. 47* (1:24,000-scale map with text).
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34. Gryta, J.J., **Bartholomew, M.J.**, 1983, Debris-Avalanche type features in Watauga County, North Carolina, p.53-61 *in* S.E. Lewis, editor, ***Geological Investigations in the Blue Ridge of Northwestern North Carolina***: *Carolina Geological Society Fieldtrip Guidebook 1983*, North Carolina Division of Land Resources, 105p.

## PUBLICATIONS (Grenville Province of USA; Iapetan Geology)

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39. Hughes, S.S., Lewis, S.E., **Bartholomew, M.J.**, Sinha, A.K., Herz, N., 2004, Geology and geochemistry of granitic and charnockitic rocks in the central Lovingston massif of the Grenvillian Blue Ridge Terrane, U.S.A., p.549-569 *in* R.P. Tollo, L. Corriveau, J.B. McLelland, **M.J. Bartholomew**, editors, 2004, ***Proterozoic Tectonic Evolution of the Grenville Orogen in North America***: *Geological Society of America Memoir197*, 820p.
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## OPEN-FILE MAPS AND REPORTS

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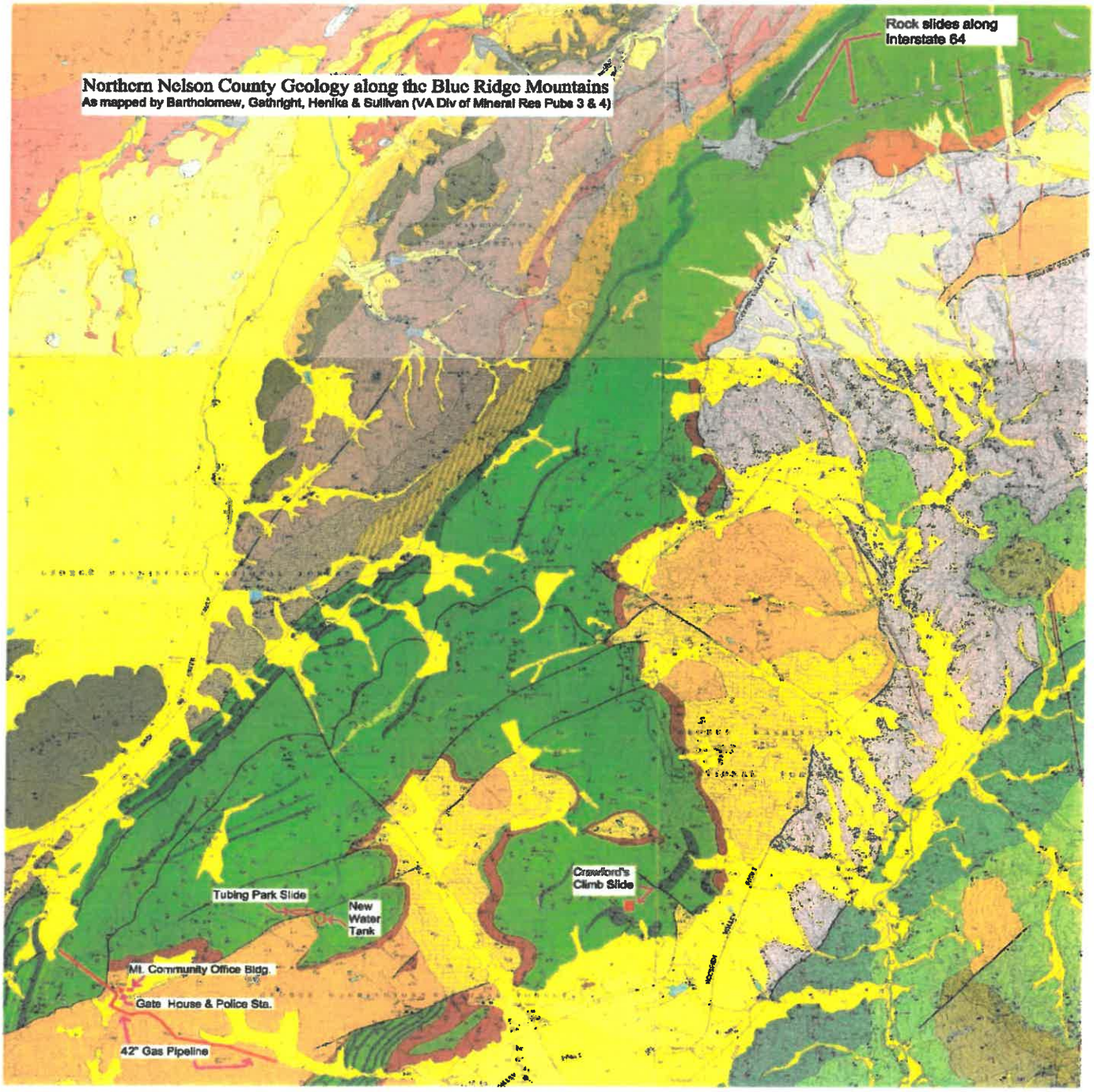


## Debris Flow / Debris Avalanche / Rock Slide Failures in Northern Nelson County, Virginia

Along the east face of the Blue Ridge Mountains, failures are common where excavation has altered drainage or the base of the slope. This is extremely common in the Catoctin Formation were foliation or bedding plane contacts are dipping southeast and parallel to the slope of the hillside. Failures have occurred on slopes where no man-made changes have been made to the terrain as well as where the terrain has been altered. Rain events are typically the catalyst that precipitates the failures. The map above shows the location of a number of recent failures and the location of the proposed Atlantic Coast Pipe across the Pond Hollow Debris Flow Collection Basin.

TO: Whom It May Concern

September 8, 2015

FROM: J. W. Garner
State Forester of VA (Ret.)

Ref: the Atlantic Coast Pipeline PF 16-5

I write not to debate the merits of the pipeline but to express my concerns for public safety along the proposed southern route – specifically in Nelson County at the entrance to the Wintergreen Resort.

I am a retired forester after 46 years with the Virginia Department of Forestry – 21 years as State Forester (agency director). During my field time I was on-the-line involved with forest fires, many in the mountainous terrain. Although the size of Virginia fires is not as large (a 1000 acre fire is not a rare event here), the intensity of a given event equals that of the notable western wildland fires.

During the early development of Wintergreen Resort, I participated in planning sessions and publicly expressed my concerns about the potential hazards of forest fires and the challenges of protection in such topography. This topography, while wild and beautiful, lends itself to rapidly spreading fire and very limited and difficult access for firefighters and equipment. There have been several "near miss" fires surrounding the Wintergreen mountain. However, other mountain developments in Virginia have not been so fortunate where wildfires resulted in the loss of homes and structures.

Compounding the normal challenges of fire control, there is only one steep, winding, two lane road to the resort at the top of the mountain. The resort has over 1000 permanent residents plus an equal number of full time employees on any given day. Special events at the resort increases this number multiple times. One way in and the same way out! Early in the development an attempt was made to seek an emergency exit at the top to the Blue Ridge Parkway. This was never approved by the National Park Service.

This southern proposed route shows the pipeline will be bored under the Blue Ridge Parkway, coming out just west of the Wintergreen entrance, and then buried under Beach Grove Road. The proposal plans a large construction site directly across from the entrance and the line buried once again under Beach Road east of the entrance. It will be debated that the construction will be temporary and all care and safety precautions will be implemented. However, this major construction site is directly across from the Wintergreen exit/entrance. The construction will last for some time (several fire seasons). There will be heavy equipment, cutting & welding, temporary road closing and other activities. One mistake or mishap could create a serious threat.

Again, I am not debating the merits of the pipeline, but specifically the location of this proposed route. Located at the very entrance to a highly populated area with such limited ingress/egress causes me significant concern. If ACP deems the most efficient way to cross the mountains is to bore under the Blue Ridge Parkway, then I would strongly urge a review and a change of the exact location of that passage. Several miles south, or preferably, north of the proposed location would avoid the potential of a catastrophic occurrence.

# ATTACHMENT
# #3

Wintergreen

88 Wintergreen Drive
Wintergreen Resort, VA 22967-2162

Wintergreen Property Owners Association

Jay W. Roberts, *Executive Director*
Tel. 434 325 8531 jayroberts@wpoainc.org

May 4, 2017

Mr. Kevin Bowman
Environmental Project Manager
Office of Energy Projects
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Mr. Bowman,

On April 11, 2017, you submitted a number of additional Environmental Information Requests to the Atlantic Coast Pipeline (ACP) relating to the ACP project. Request number 106 is of interest to the Wintergreen Community and it stated:

**"In response to numerous comments received on the draft EIS, describe in more detail how Atlantic would work with local law enforcement and emergency response to promote the safe evacuation of landowners in remote areas should a pipeline incident occur. Consult with each landowner where the proposed pipeline crosses a private egress that is the sole access to/from the property to determine if a site-specific evacuation procedure is requested."**

For nearly two years, Wintergreen Property Owners Association ("WPOA"), Friends of Wintergreen ("FOW"), individual homeowners and others have raised serious safety concerns about the catastrophic consequences of a pipeline explosion, landslide or leak requiring evacuation of the immediate area at or near the entrance to Wintergreen. In our submission to FERC dated February 25, 2017, WPOA stated:

**"We are at a loss to explain why a high pressure 42 inch pipeline route is currently engineered to disturb a potentially catastrophic landslide area. In the event of slope failure and any potential related explosion, Wintergreen's police offices, 911 command center and the community's administrative offices would likely experience destruction and loss of life. In addition, the Wintergreen community's only entrance and exit would be blocked by the resulting debris avalanche and/or a fire. To further this point, Virginia recently retired state forester describes his concerns in a separate letter enclosed. When considered objectively, the potential risks to human life of this route are real and well supported by science"**

On Monday May 1st, 2017 I received notice of ACP's answers to question 106. ACP responded with:

**"Atlantic and DTI are currently working with Local Emergency Planning Committees (LEPCs) to develop Emergency Response Plans for construction. In circumstances where ingress and egress may be impaired during construction, Atlantic and DTI stipulate to landowners that temporary measures will be taken to ensure continued ingress and egress. As the project approaches completion, Dominion Operations will provide relevant information, including the pipeline location, to the same LEPCs to support the development of Operational Emergency Response Plans. The Operational Emergency Response Plans would address incident evacuation requirements. In the unlikely case of an operational incident, Atlantic and DTI would coordinate with landowners and local emergency response services to implement the LEPC Emergency Response Plan to address the specific situation"**

I am extremely concerned about the lack of detail and inaccuracies offered up in this response. When you consider the risks involved, the response is completely unacceptable. Please consider:

1. In its own words, ACP acknowledges - **"Atlantic and DTI are currently working with Local Emergency Planning Committees (LEPCs) to develop Emergency Response Plans for construction".** There is no LEPC within Nelson County and ACP has held no discussions with the Nelson County Emergency Services Council. Per Wintergreen Fire and Rescue Chief Curtis Sheets, **"Regarding evacuation planning for Wintergreen in the event of a pipeline emergency, there have been no meetings. In their response to section 106 of the FERC filing, Dominion references their work with Local Emergency Planning Committees (LEPC). There is no active committee in Nelson County Virginia. Nelson relegates this responsibility to the Nelson County Emergency Services Council (NCESC) Wintergreen does hold a voting position on the NCESC and has been represented at every meeting for the past 15 years. At no point has any representative from Dominion Power or the Atlantic Coast Pipeline met with or corresponded with the NCESC."**
2. Wintergreen represents the epicenter of the concerns brought forward in question 106. We know of no other place in the Commonwealth of VA where an entire community is completely trapped should an emergency occur during construction or at any point after the pipeline is in place. A landslide, gas leak, explosion or resulting fire can all isolate and entrap potentially thousands of people.
3. Wintergreen has communicated directly with Dominion/ACP about the enormous risks associated with the current route and the need to have a plan in place that adequately addresses the safety of the community. In their response to your request, ACP states - **"As the project approaches completion, Dominion Operations will provide relevant information, including the pipeline location, to the same LEPCs to support the development of Operational Emergency Response Plans."** Given the circumstances, FERC should not allow construction to begin in hopes that

the safety issues can be resolved. The current route for the ACP blocks the only entrance and exit for the entire mountain community. Given that no other access or evacuation routes exist, it is highly likely that no adequate evacuation plan can ever be developed. With an entire community at risk, FERC should require Dominion/ ACP to put in place an acceptable solution BEFORE construction is allowed to begin.

As of today, WPOA has received no communication from ACP or Dominion on request number 106, yet, Dominion and ACP are well aware of Wintergreen's concerns on this issue. We sincerely appreciate FERC recognizing the enormous safety concerns associated with the current route cutting off access and the need to protect the Wintergreen Community from harm. The lack of substance in their official response on May 1st and lack of any follow up from ACP on this issue is deeply concerning and we ask that you continue to engage ACP on the matter. Given the severity of the risk, your request for an acceptable solution before construction begins is both reasonable and critically important.

Sincerely,

Jay Roberts
Executive Director
Wintergreen Property Owners Association

CC: Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426