Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

December 21, 2016

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

RE: Mountain Valley Pipeline, LLC
Docket No. CP16-10-000

Dear Ms. Bose:

I am writing today to transmit the attached December 20, 2016 letter from the Virginia Cave Board to you regarding comments and recommendations on the proposed Mountain Valley Pipeline. The information presented was that of the Virginia Cave Board, an Advisory Board of the Commonwealth of Virginia under *Code of Virginia* § 10.1-1000 – 1008, and not that of my agency or this administration.

The Cave Board letter includes important karst features along the proposed pipeline route, recommendations on management of surface water and runoff in karst areas and general information on construction of pipelines through karst regions.

Sincerely,

Clyde E. Cristman
Director

Molly Joseph Ward
Secretary of Natural Resources

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Tom Smith
Deputy Director of Operations

Rochelle Altholz
Deputy Director of Administration
and Finance

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

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

December 20, 2016

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Mountain Valley Pipeline, LLC
Docket No. CP16-10-000

Virginia Cave Board comments and recommendations concerning the Draft Environmental Impact Statement for the proposed Mountain Valley Pipeline route through karst areas of Virginia

Dear Ms. Bose,

First enacted in 1966, the Virginia Cave Protection Act was established to protect the cave and karst resources of the Commonwealth of Virginia. As part of an amendment to the Act, The Virginia Cave Board was established in 1979 and charged with advising local, state, and federal governmental entities on matters concerning caves and karst lands throughout the Commonwealth. The Virginia Cave Board has the duty to make recommendations concerning any proposed rule, regulation or administrative policy that directly affects the use and conservation of caves in the Commonwealth.

Therefore, the Virginia Cave Board is writing to provide input and recommendations for protection of cave and karst resources in Virginia with respect to the proposed construction of the Mountain Valley Pipeline (MVP). We have reviewed the draft Environmental Impact Statement (EIS) released by FERC on September 19, 2016, as well as the proposed changes to the pipeline route made by MVP LLC in October of 2016.

We have a number of concerns regarding the intersection of the proposed pipeline route (as of this writing) with known significant and sensitive cave and karst conservation areas in Virginia. The details of these areas and their natural resources were initially described in a separate document submitted to FERC by the Virginia Department of Conservation and Recreation, submittal number 20160317-5126. Further, the Virginia Cave Board submitted its own comments and recommendations regarding pipeline construction in karst areas to FERC (submittal number 20150420-5031). Modifications to the pipeline route by MVP in October 2016 required additional evaluation, which we summarize herein.

We are pleased to see that the MVP LLC has adopted many of our earlier recommendations, and that FERC has requested several of these avoidance and mitigation actions within the Karst Mitigation Plan and Karst-Specific Erosion and Sediment Control Plan proposed by MVP. However, we find that the proposed pipeline route still poses a serious threat of deleterious impacts on known karst areas that are present at Conservation Sites and Natural Area Preserves within the Commonwealth, and that certain serious deficiencies still exist in the draft EIS with respect to the identification and monitoring of impacts on groundwater and sensitive karst features.

In particular, we assert that:

1. Intersections of the MVP October 2016 (Rev 5) route with the following karst conservation sites and natural area preserves identified by the DCR-DNH will potentially result in negative impacts on sensitive karst environments and are NOT recommended:

- Mill Creek Springs Natural Area Preserve;
- Roanoke River-North and South Forks Stream Conservation Unit;
- Stony Creek Stream Conservation Unit;
- Clover Hollow Conservation Site;
- Craig Creek Stream Conservation Unit;
- Canoe Cave Conservation Site;
- Slussers Chapel Conservation Site;
- Old Mill Conservation Site;
- Kimballton Quarry (access roads);
- The Elliston Glades Conservation Site (this site is immediately adjacent to pipeyard MVP-PY-006 as identified in the October 2016, Rev 5 route).

The Virginia Cave Board fully supports and reiterates the comments and recommendations made by the staff of the Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR-DNH) to the Virginia Department of Environmental Quality in a memorandum dated November 14, 2016 (see **Appendix I**) regarding protection and monitoring of cave and karst features in relation to the proposed MVP project.

As was pointed out in that document, “it will be difficult to accurately assess impacts to some karst resources due to the failure by FERC to require karst hydrological investigations to determine subterranean flow paths in all karst areas crossed by the pipeline, access roads, layout yards, and fueling stations. The draft EIS also fails to document places where channels terminate downstream of the project in swallets, especially in cases where swallets are more than 400ft from the project centerline. Furthermore, the well and spring sampling protocol was based on an arbitrary buffer rather than the results of a meaningful (robust, thorough) karst hydrology study. Finally, proposed spot sampling is not sufficient to characterize highly variable karst waters, particularly springs.”

We recommend more stringent watershed basin delineation and water quality monitoring within **all** karst areas crossed by the MVP. Such delineations and monitoring should include a detailed and comprehensive inventory of all karst features (including caves, closed depressions, sinkholes, solutionally-enhanced fracture traces, and springs) within a zone of influence of surface runoff within

and **extending beyond** the primary (150 ft) and secondary (1/4 mile) buffers of the MVP route. The zone of influence of surface runoff should be determined via a standard surface watershed delineation procedure. This would specifically be one that utilizes high-resolution (1 m or less horizontal resolution, 10 cm or less vertical resolution) topographic information obtained via LiDAR (light detection and ranging) surveys, and which would extend from areas of highest topographic relief to outlets of channelized runoff, and which especially would be considering focused perennial and ephemeral stream flows. Such watershed delineation must include a determination of karst features (swallets) that actively take surface runoff and route it into underground pathways. These features must be subject to a greater degree of investigation so as to unequivocally determine where the subsurface flow goes. This determination should be made using tracer tests that employ non-toxic dyes (dye-tracing) that can be easily detected at low concentration at monitoring points.

We strongly recommend complete avoidance of areas along the proposed MVP route where surface flows within – and runoff of sediment from – the zone of pipeline construction and access roads will adversely impact sensitive cave and karst systems. These impacts can only truly be determined through tracer tests. Specific karst features for which dye-tracing can already be advised are listed in the DCR-DNH memorandum (Appendix I).

We wish to emphasize that such detailed hydrological assessments in karst terrains crossed by the MVP will serve three critically important purposes: 1) **avoidance** of (and thus protection of) sensitive cave and karst resources, and 2) **prevention** of costly mitigation measures to the MVP resulting from deleterious impacts, and/or 3) the ability to mount a **rapid response** to mitigate against any future unintentional releases of sediment or contaminants along the MVP route.

An informative and valuable example of how such knowledge of surface and subsurface flow pathways could and probably would have prevented degradation of an important karst resource occurred in July of 2016, when a fuel spill at a recent natural gas pipeline construction project in Giles County, Virginia may have contaminated the public drinking water supply of Peterstown, West Virginia (http://www.roanoke.com/business/pipeline-opponents-cite-contamination-of-drinking-water-supply-as-cautionary/article_1172b929-8960-54a6-abdc-1784023dd5b9.html). Had Columbia Gas of Virginia performed proactive hydrological studies such as those that we are recommending herein for the MVP project, there would have been prior knowledge as to where the spill potentially could would go, and such knowledge could have made it possible for Columbia Gas of Virginia to inform the water system operator immediately as to the impending presence of spilled fuel, thereby providing the water system operator with critical time to decide how best to mitigate the problem. In addition, more detailed knowledge of flow pathways would have made it possible for private well owners along the delineated groundwater basin to have been notified immediately after the spill occurrence.

In addition, we find that provisions made in the draft EIS for water quality monitoring are insufficient. The current water quality testing plan prescribes monitoring within a buffer of only 500 ft of the pipeline work areas; such a buffer distance is inadequate and quite arbitrary, especially in a karst region where groundwater can travel at velocities that in some instances are measured in miles per day. As cited above, the fuel spill incident along a pipeline route may have impacted a spring used for the Peterstown, West Virginia public water supply, and that spring is located about 2000 ft (straight line distance) from the pipeline corridor. Distances of this type are not at all uncommon in karst regions, which are

typically characterized by subsurface drainage divides that do not match surface drainage divides, and so we recommend that the following specific measures be taken along the MVP route:

- Water quality monitoring in all karst areas, and this monitoring should include all springs and wells within topographically-delineated catchments crossed by the pipeline right of way that drain surface runoff to active or ephemeral channels, and to closed depressions (swallets);

- Dye-tracing should be employed to delineate boundaries of groundwater drainage basins that gain recharge from within those catchments of surface runoff as outlined above, including the drainage divide boundaries that delineate storm-flow (high water) overflow routes, which are commonly quite different than fair-weather low-flow routes;

- Water quality monitoring at springs affected by the catchments of surface runoff areas outlined above should include continuous measurements of turbidity, temperature, and specific electrical conductance using datalogging sensors, in order to adequately assess the rapid changes that can occur in karst regions due to land disturbance.

In regard to the preferred pipeline route, we support the recommendation by the DCR-DNH to re-route the MVP Mount Tabor Alternative. This would minimize impacts on the Slussers Chapel Conservation Site by adopting an alternative route across non-carbonate bedrock that is present along and parallel to the ridgeline of the topographic divide on the northeastern edge of the site, rather than the route that traverses carbonate bedrock lower down the slope of the mountain, where the MVP would cross nearer to and through the area of well-developed karst that is present on these exposures of carbonate bedrock (**Fig. 1**). A conceptual route for such avoidance was filed by the Virginia DCR with FERC on September 9, 2016 (Docket CP16-10-000, Submittal 20160909-5315). This submittal advised FERC and MVP that there are ways to move the pipeline to the north of the Mount Tabor Alternative and that such a move would significantly reduce the likelihood of negative impacts to the Slussers Chapel Conservation Site. Such avoidance would require routing of the MVP onto National Forest land, but not within any designated wilderness area. While such avoidance would still lie within the Slussers Chapel Conservation Site, the existing geologic and hydrologic evidence suggests that this alternate route should significantly reduce the likelihood and severity of impacts to the system (see **Appendix II**). This alternate route was also endorsed by resolution of the Town of Blacksburg, Virginia (submittal #20161212-5092).

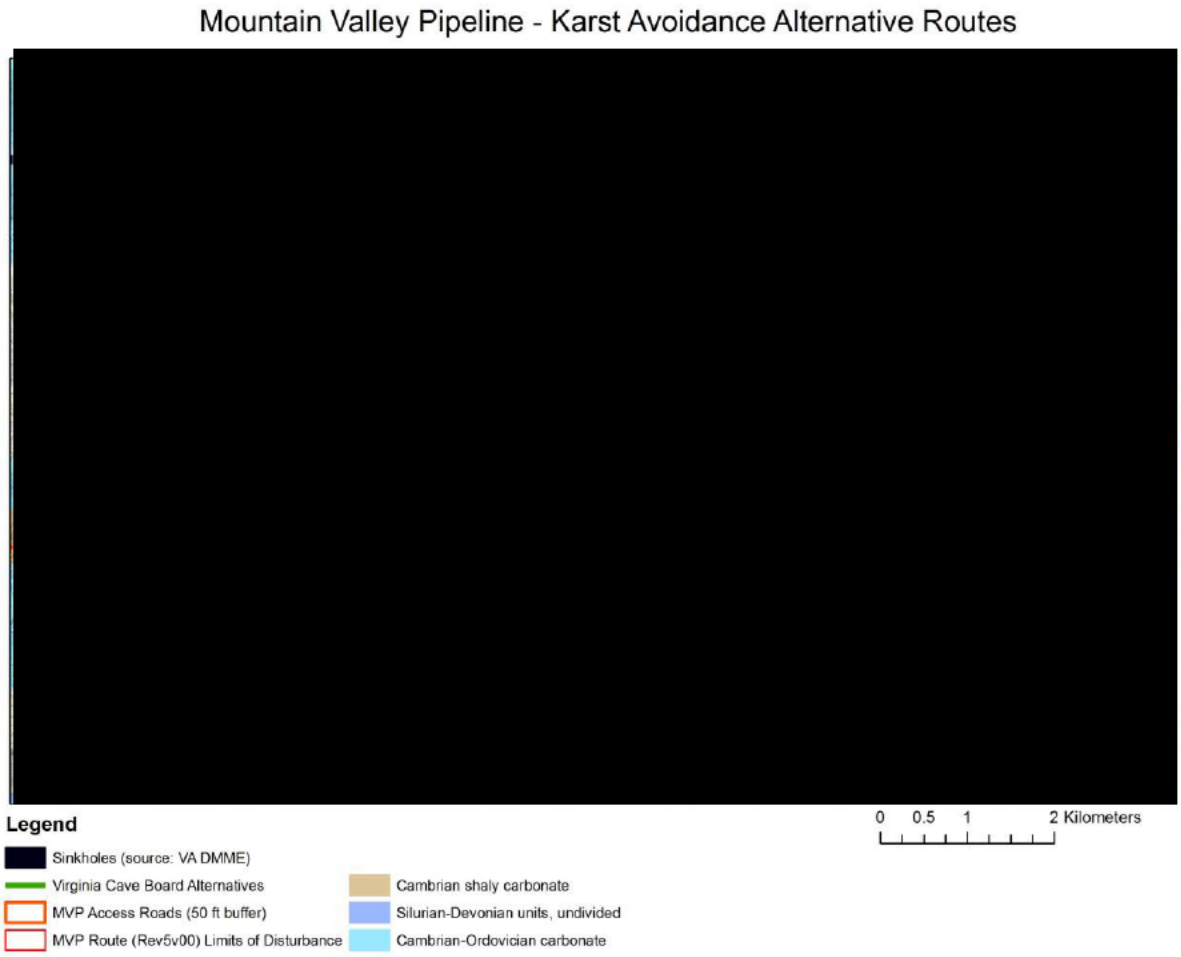


Figure 1. Alternate proposed MVP routes for karst avoidance. The Virginia Cave Board recommends placing the route along the southeast flank of Sinking Creek Mountain as opposed to within the belt of Cambrian-Ordovician carbonate rocks on the northwest flank, and to place the route along the crest of Brush Mountain to avoid crossing the belt of sensitive karst within the Slussers Chapel Conservation Site lower down the slope (DCR's recommended route—see Appendix II).

Furthermore, we also support the recommendation by DCR-DNH to change the MVP Canoe Cave Reroute in order to avoid routing the corridor parallel to and within the belt of carbonate bedrock on the northwest flank of Sinking Creek Mountain. Although Canoe Cave is the only documented significant cave along that belt of karst, the entire belt of outcropping limestone along the northwest flank of Sinking Creek Mountain is a known cave-forming unit of bedrock that is very likely to host additional undocumented and potentially significant karst features, and associated biota. In general, we recommend to avoid routing the MVP along or higher than (in terms of elevation) belts of significant karst and karst-forming carbonate rock units. Instead, we recommend that the MVP cross such outcrop belts of carbonate rock perpendicular to the geologic strike, thus minimizing the karst area exposed to the effects of land disturbance. Avoiding a route that is elevated above and parallel to an outcrop belt of carbonate rock further minimizes the likelihood of contaminated runoff flowing downhill toward karst areas that exist along and on that outcrop of carbonate rock. If the MVP route were instead located on the southeast slope of Sinking Creek Mountain, and within the belt of non-carbonate rocks of Silurian-

Devonian age, there would be less likelihood of negative impacts of karst areas and specific karst features. Detailed geologic mapping should be conducted to place the pipeline route within a belt of Devonian shale that is located downslope of the resistant Ridgeley Sandstone, thus placing the pipeline route downslope of the carbonate units that outcrop upslope and at higher elevations on the southeast flank of Sinking Creek Mountain.

We advise MVP to work directly with the Virginia DEQ and DCR on alternate routing of the proposed pipeline.

Sincerely,
Steve Lindeman, Acting Chair
Virginia Cave Board

DRAFT

APPENDIX I

MEMORANDUM

DATE: November 14, 2016

TO: Julia Wellman, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 16-194F, Mountain Valley Pipeline Project

Division of Planning and Recreation Resources

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

The scenic and recreation resources that are potentially impacted by the route are as follows:

- Stony Creek Road & Route 42 (Byway)– Giles County
- Catawba Road (Byway) - Montgomery County
- Pigg River (designated water trail)– Pittsylvania County

The Environmental Statement document indicates that the crossing of the above resources are perpendicular, thereby limiting impacts to the resource. We recommend that all site restoration be done with native plant species to restore the scenic value of the affected resources to the greatest extent possible.

We anticipate that the route easement could offer connection for both regional and local trail systems, for this reason we recommend coordination with Jennifer Wampler, DCR's Trail Coordinator, at Jennifier.Wampler@dcr.virginia.gov to discuss this potential mitigation process.

We recommend coordination with the National Park Service regarding impact to the following federal resources:

- Nationally Scenic Byway - The Blue Ridge Parkway
- The Appalachian Trail

Division of Soil and Water Conservation

We recommend any impacted BMPs along the route (Map attached) be reinstalled or relocated, e.g. livestock fences and stream crossings re-erected, watering systems relocated, cover crops reimbursed to the farmers, and disturbed areas re-vegetated. One impact that cannot be fully mitigated will be the loss of trees in planted buffers which, if cost shared, would be from combined federal/state contributions. Since trees cannot be replanted near a buried pipeline, there will be some degree of permanent impact. While the loss of trees is also addressed in DCRs Forest loss impact analysis, we feel that tree loss associated with impacted BMPs must also be addressed on a case by case basis. Please contact Darryl Glover with any questions or concerns at Darryl.Glover@dcr.virginia.gov.

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage's (DCR-DNH) mission is conserving Virginia's biodiversity through inventory, protection, and stewardship. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

The Virginia Department of Conservation and Recreation previously provided comments on the Mountain Valley Pipeline Project under FERC Docket PF15-3-000 on June 11, 2015 (accession number 20150611-5170); and FERC Docket CP16-10 on March 17, 2016 (accession number 20160317-5126), May 20, 2016 (accession number 20160520-5051) and September 9, 2016 (accession 20160909-5315).

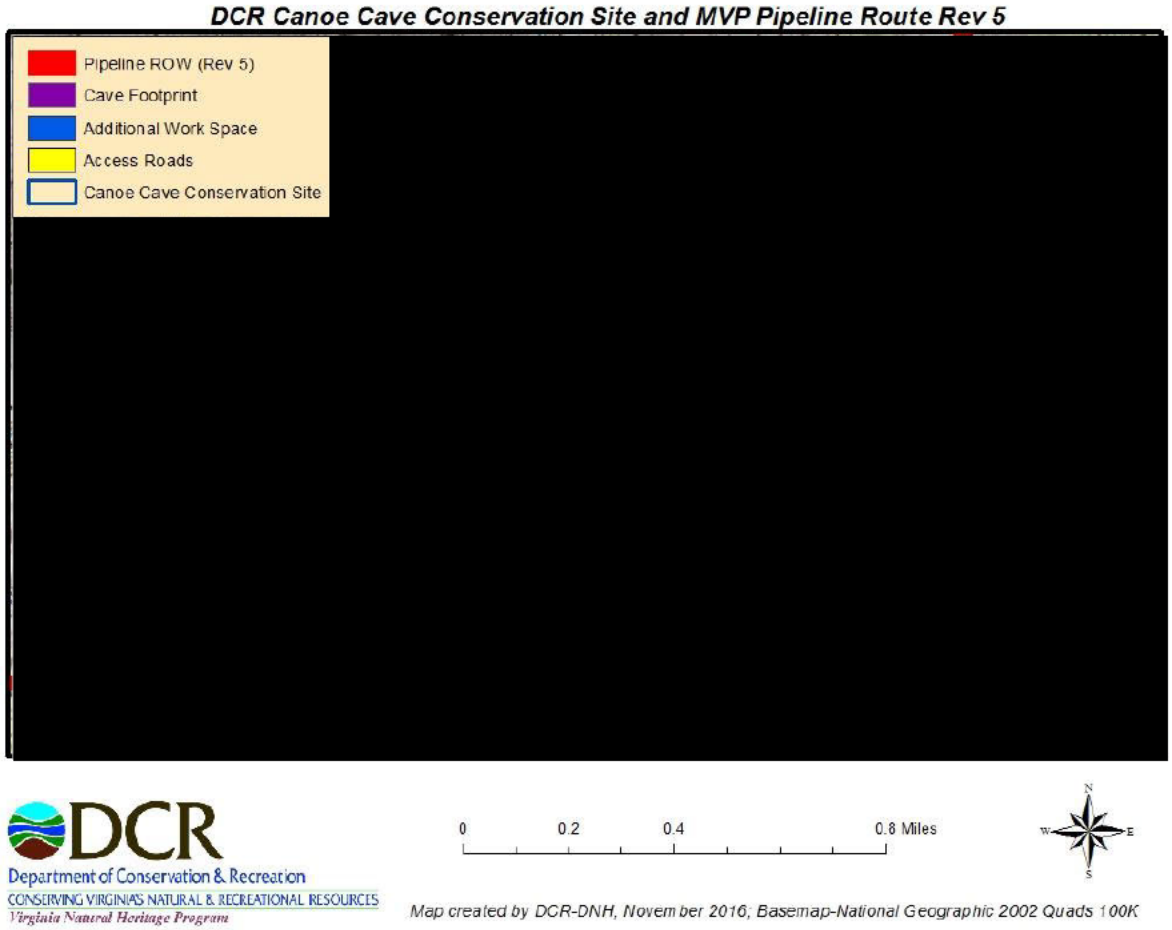
DCR-DNH offers the following comments on the Mountain Valley Pipeline Draft Environmental Impact Statement (DEIS) and associated documents.

On page 4-158 of the DEIS, the DCR-DNH filing from June 11, 2015 is incorrectly referenced in footnote 19 as accession number 20160611-5170 and on page 3-42 first paragraph, the DCR June 11, 2015 is incorrectly referenced as the DCR April 6, 2015 letter.

3.5.1 Mountain Valley Project Route Variations

In supplemental filings from MVP to FERC in October 2016, minor route adjustments were made to avoid potential impacts to some sinkhole and cave features, including the cave passage at Canoe Cave Conservation Site (see Figure 3.5.1-1 on page 3-29 and page 4-35). The new alignment runs between the spring where water drains from the aquifer exposed in lakes within Canoe Cave and Sinking Creek, which receives the spring run (See Figure 1). While this significantly reduces the potential impact on the cave proper, the proposed route and the associated access road still lie within the conservation site for the significant cave (Figure 1), which is a documented hibernation site for the federally threatened Northern long-eared bat (*Myotis septentrionalis,* G1G2/S3/LT/LT). The extent to which the karst exposed to the east and west of the Canoe Cave reroute contributes to the water in Canoe Cave and the spring is undetermined. DCR-DNH recommends dye trace investigations to determine the recharge area of the spring and cave. While Canoe Cave is the only documented significant cave along that belt of karst, the entire belt of limestone along the north flank of Sinking Creek mountain is a strong cave former and is likely to host undocumented and potentially significant karst features and associated biota. In general, DCR-DNH recommends the pipeline avoid running parallel along or upslope of belts of significant karst. In general, crossing these belts perpendicularly to the geologic strike, would minimize the karst area exposed to the effects of land disturbance.

Figure 1



3.5.1.7 Mount Tabor Variation

In supplemental filings from MVP to FERC in October 2016, MVP filed the Mount Tabor alternative which is currently incorporated into the preferred route (Rev 5). As indicated in DCR's May 2016 filing, the Mount Tabor alternative does not significantly change the length of the pipeline corridor within the Slussers Chapel Conservation Site, which contains two state designated significant caves, smaller biologically significant caves, several tracts under conservation easement from the Virginia Outdoors Foundation, and a designated state natural area preserve (Mill Creek Springs Natural Area Preserve (NAP)) owned by The Nature Conservancy (TNC) named the Blake Preserve.

The Mount Tabor reroute moves the proposed section of the line through the Slussers Chapel Conservation site off of karst bedrock and the Mount Tabor sinkhole plain onto non-carbonate rocks just to the north. However, the Mount Tabor alternative crosses five deeply incised stream channels (some intermittent,

others perennial) immediately upstream of the contact with the karst of the Slussers Chapel Conservation Site. These streams sink underground at or near the limestone contact, and likely drain through Slussers Chapel Cave and Mill Creek Cave to Mill Creek Spring, a tributary to the Roanoke River that flows through the Mill Creek Springs NAP (TNC Blake Preserve). Construction through these channels will likely increase erosion, both during and subsequent to construction, leading to significant long-term impacts to the karst system of the Slussers Chapel Conservation site, as well as increased sedimentation to the Roanoke River downstream. DCR-DNH strongly recommends rerouting of this portion of the Mount Tabor alternative to avoid areas of concentrated water flow and associated erosion and subsequent sedimentation. A letter addressing this avoidance was filed by VA-DCR-DNH with FERC on September 9, 2016 (Docket CP16-10-000, Accession 20160909-5315.) The main point of this submittal by DCR-DNH was to point out to FERC and MVP that, contrary to communication from the MVP to DCR, there are ways to avoid or significantly reduce the likelihood of impact to the Slussers Chapel Conservation Site. Such avoidance would require routing onto the National Forest, but not within a designated wilderness area. While such avoidance would still intersect the Slussers Chapel Conservation Site, it should significantly reduce the likelihood and severity of impacts to the system.

4.1.1.5 Geologic Hazards

As described on page 4-34 (paragraph 1) "Because karst features provide a direct connection to groundwater", DCR recommends karst hydrology studies (dye tracing) are performed along any areas with karst features proximal to the corridor, access roads, layout yards, or fueling stations, unless such data already exists (e.g. portion of the Mount Tabor area in Montgomery County and Doe Creek area in Giles county).

MVP has rerouted the alignment around Canoe Cave, but this karst feature is part of a broader belt of karst with numerous hazards. DCR-DNH continues to recommend avoidance of the Canoe Cave Conservation Site (See comments in Karst Hazard Assessment review) and supports MVP continuing efforts to evaluate route adjustments as stated on page 4-35 (paragraph 4).

As stated on page 4-36 (paragraph 1) "the current proposed alignment for the MVP pipeline would also cross the Mount Tabor Sinkhole Plain". Both alternatives (as submitted for the DEIS and the Mount Tabor alternative, the proposed corridor in the Oct 2016 (Rev 5) filing) have equal risk from a karst perspective, especially in terms of potential for contamination of karst groundwater. DCR-DNH recommends that MVP continue to evaluate alternatives in search of one that minimizes proximity to karst features and drainages associated with the Slussers Chapel Conservation Site. (See detailed comments in Karst Hazard Assessment review).

Section 4.1.2.5 Karst Terrain

Mountain Valley has revised the route and submitted a new proposed corridor to FERC in October 2016 (REV 5) per DEIS recommendations in Section 3.5.1 page 4-49 -paragraph 3. The Canoe Cave reroute in the October filing is an improvement on what was in the earlier proposed route (Rev 4.0), but still passes within the conservation site. Perhaps more importantly, the Canoe Cave conservation site is part of a 4.5 mile long section of the pipeline that runs along well-developed karst on the northwest flank of Sinking Creek Mountain. Karst hydrology studies should be performed in this area so that in the event of a release, recovery operations may be instigated at appropriate springs and wells.

Mountain Valley also included the Mount Tabor Variation as the proposed corridor in the October 2016 (Rev 5) submission to FERC. This route offers no improvement in terms of potential impact to karst systems, but does avoid crossing the Mill Creek Springs Natural Area Preserve and Mill Creek Valley downstream of the Preserve. However, it has a higher potential to impact Mill Creek Spring itself due to crossings of multiple channels of Mill Creek and its tributaries just upstream of points where they sink into the Slussers Chapel-

Mill Creek karst system. DCR-DNH strongly recommends rerouting of this portion of the Mount Tabor alternative to avoid areas of concentrated water flow and associated erosion and subsequent sedimentation. A conceptual avoidance was filed by VA-DCR-DNH with FERC on September 9, 2016 (Docket CP16-10-000, Accession 20160909-5315.). **Figure 2** shows the crossings of concern and their proximity to known inputs to the Slussers Chapel-Mill Creek karst system.

Figure 2

DCR-DNH supports the Karst-specific Erosion and Sediment Control plan proposed management practices described on page 4-49-paragraphs 4 and 5. However, these practices do not completely eliminate the possibility of a sediment or other contaminant release during construction, maintenance, and operation of the Mountain Valley Pipeline. Therefore, DCR-DNH recommends dye trace studies to determine subsurface flow paths in areas where the pipeline, access roads, layout yards, or fueling stations cross or lie upslope along drainages from karst features. Specific features meriting dye trace studies are identified in DCR-DNH review of the **Karst Hazard Assessment** document, referenced by milepost as specified in the October, 2016

submission. DCR-DNH recommends MVP determine these subterranean flow paths so that in the unlikely event of a spill, recovery and monitoring efforts may begin immediately and at the appropriate location.

Sheet 13

There is significant karst development in this area (Kow Camp Karst) including several partially explored caves with potential to be large in size. DCR-DNH recommends extreme care will need to be exercised during construction, as any spill could easily find its way into the karst system.

Sheet 21-26

The proposed corridor runs for about 4.5 miles along a belt of karst on the northwestern flank of Sinking Creek Mountain, working its way around numerous karst features, including a significant cave (Canoe Cave) with records of hibernacula use by federally threatened Northern long-eared bat and state endangered Tri-colored bat (*Perimyotis subflavus*, G2G3/S1S3/NL/LE) bat species. While potential impacts to the Canoe Cave conservation site proper are reduced by routing the pipeline between the resurgent spring and Sinking Creek, the belt of karst as a whole still remains at risk for impact from the project, as evidenced by the numerous karst features identified along this section by Draper Aden and Associates (DAA), many of which are incompletely documented in terms of subterranean extent and hydrological flow characteristics. There may be feasible alternatives to reroute all or part of this section of the pipeline to areas less likely to impact karst systems. If not, DCR-DNH recommends comprehensive hydrological delineation prior to construction for purposes of spill response planning.

Sheet 23

The October 2016 (Rev 5) route avoids crossing cave passage associated with Canoe Cave, running between the presumed resurgence spring and Sinking Creek. However, the recharge boundaries for the spring have not been determined, and may include areas crossed by the proposed route west and east of Sheet 23. DCR-DNH advises hydrological studies be conducted to determine the recharge area for the spring at MP 214.86.

Sheet 27

The proposed corridor crosses the stream that sinks at the swallet within the blind valley containing the Slussers Chapel cave entrance, at the approximate upstream limit of the closed depression. There are pre-existing erosional issues within this blind valley, and active land disturbance associated with a pipeline crossing would exacerbate these issues. Also, the channel has intermittent high flows and it is likely that erosion will over time expose the pipeline within the channel. Finally, note that the pipeline also crosses this same channel just west of Sheet 27. DCR-DNH recommends both of these crossings be eliminated by rerouting of the pipeline in this area.

Sheet 28

Mill Creek sinks (swallet) approximately at the southern boundary of the 1320' buffer of the Oct 2016 (Rev 5) Proposed route. The proposed route crossed three highly erodible channels upstream of the feature along Mill Creek and its tributaries. The Mill Creek swallet was only recently located by DCR-DNH, but its existence is not surprising given the preponderance of sinking streams in this area. It is likely that this sinking stream reappears as part of the stream in Slussers Chapel Cave. Currently, this feature and the swallet in the entrance sink to Slussers Chapel Cave proper (Sheet 27) are at risk from the Oct 2016 (Rev 5) proposed

pipeline route. DCR-DNH strongly recommends rerouting to avoid disturbance to these active stream channels that lead to discrete inputs (swallets) of the Slussers Chapel – Mill Creek system. Also, note that updated data on Thundercroft Fissure should be obtained. This cave has an active stream that likely is a tributary to the stream in Slussers Chapel Cave and subsequently to Mill Creek Spring.

Sheet 32

This is a good example of a place where dye tracing would be useful to pre-determine the fate of any sediment or other releases associated with pipeline construction, maintenance, or operation. DCR-DNH recommends features like the Sinkhole at 227.57 and the sinkhole at 226.89 be dye traced prior to construction. This situation exists in numerous locations along the pipeline as outlined below.

Features in Virginia along MVP for which hydrology studies (dye tracing) is advised:
201.66 (2 features) – (Sheet 10)
205.02 (Eight Point Cave) and 205.20 (High Voltage Cave) – (Sheet 13)
209.10 (Sheet 17)
209.75 (Sheet 18)
215.24 (Sheet 23)
216.22 (Sheet 24)
216.52, 217.13 (Sheet 25)
218.15 (Sheet 26)
223.33, 223.34, 223.46 (Sheet 28) –a single dye trace or possibly 2.
224.00 (Sheet 29)
226.20 (Sheet 31) -consistent with dye traces by DCR-DNH as cited.
226.89 (Sheet 32)
227.57 (Sheet 32)
234.43, 234.73, 235.13 (Sheet 34)

Section 4.3.1 Groundwater
It is accurate that karst aquifers are crossed by MVP, and that they are particularly sensitive to contamination since water and contaminants can enter the aquifer quickly and travel long distances rapidly along difficult to predict flow paths. Because of this, DCR-DNH recommends hydrological delineations based on dye tracing studies as well as geological analysis be performed for each karst area crossed by the Mountain Valley Pipeline. Such delineations make possible a rapid response should the release of sediment or contaminants to the karst system occur during construction, operation, and maintenance of the Mountain Valley Pipeline.

Table 4.3.1-1 Aquifers Crossed by the Mountain Valley Project
According to DCR-DNH, the table on pages 4-69 and 4-70 identifying aquifers crossed by the pipeline is too generalized. Furthermore, the table does not list the Cambro-Ordovician Karst Aquifer system of Montgomery County, which begins at the southern base of Brush Mountain and extends across the North Fork of the Roanoke River. This includes the Slussers Chapel and Old Mill DCR-DNH Natural Heritage conservation sites. This is a significant karst aquifer with both vadose (cave) and phreatic component, and has numerous springs and complicated, partially delineated flow paths.

Groundwater in Karst Terrain
According to DCR-DNH, in this section there is an accurate discussion of recharge processes on page 4-72 (paragraph 4). A small technical note: sandstone is not forming ridges because it is dense. In fact, it is slightly less dense (S.G = 2.65) than carbonate rocks (limestone, 2.71, dolostone, 2.84.) Instead, it forms the ridges because it is hard. A well cemented quartz sandstone like those forming ridges in the project area is on the order of a thousand times harder than limestone or dolomite.

DCR-DNH recommends clarification of why springs and swallets are placed in the same table on page 4-73 (Table 4.3.1-2), as they are on opposite ends of the karst hydrology system. By definition, swallets are places where surface water becomes groundwater and function as natural injection wells. Springs are places where groundwater becomes surface water. Wells are places where groundwater is withdrawn for use by humans.

Basing the identification of springs potentially impacted by MVP on an arbitrary 500ft buffer is not a valid assessment of these potential impacts in karst terrain. Karst dye traces in Virginia have documented flow paths of up to 7 miles, typically in a few days, and traces of more than a mile from swallets or caves to springs or wells are commonplace. The primary and most meaningful strategy to determine groundwater resources that could be impacted by MVP in karst areas is the performance of hydrological studies that incorporate dye tracing as a primary technique. As part of due diligence for the project, DCR-DNH recommends swallets, sinkholes, cave entrances, and other potential receiving karst features in proximity to the pipeline which may receive runoff be identified, and subterranean flow paths from them determined. This will make it possible to quickly and effectively initiate spill response and containment procedures in the unlikely event of a spill or sediment discharge during construction, operation, or maintenance of the pipeline. Some pre-existing dye tracing data exists for portions of MVP, and has been acknowledged by their consultant in the Karst Hazards Assessment. However, the majority of the karst hydrology has not been delineated.

Also, note that perennial and intermittent streams in karst often terminate in swallets. These swallets may be more than 500 feet from the pipeline and still receive contaminants from a release, impacting groundwater. Any drainages crossed by the pipeline either on or upslope from karst should be followed to see whether they terminate in swallets. A good example of this is in the Slussers Chapel area of Montgomery County, where 5 stream crossings clearly have high potential to impact two swallets downstream of the proposed corridor (Oct, 2016-Rev 5), yet none of them are within 500ft of the line (see **Figure 2** above).

4.3.1.2 Environmental Consequences

Karst Terrain

DCR-DNH supports the measures outlined on page 4-79 to reduce the potential for impact to karst systems and should dramatically reduce the likelihood of sediment and other contaminants to the karst aquifers. However, no measures are sufficient to eliminate the need for karst hydrologic delineations for all karst areas crossed by the Mountain Valley Pipeline. This does not mean that every feature must be traced, but rather that tracing has to be done in such a way as to determine the flow directions and destination of features that may receive runoff from the proposed corridor, access roads, layout yards, and fueling stations.

The last (5th) paragraph on page 4-79 cites a fracture trace/lineament analysis to determine between karst input features and springs and wells. The results of such an analysis are only meaningful if verified by dye tracing studies.

Water Supply Wells, Springs and Swallets

On page 4-80 (last paragraph), DCR-DNH is concerned the proposed 500 feet buffer for identifying water sources in karst terrain in relation to the pipeline route is not adequate for identifying potential areas of impacts as karst groundwaters can move miles in a day (see above comments for Groundwater in Karst Terrain). DCR-DNH recommends a systematic hydrological study involving dye tracing be conducted within each karst area crossed by MVP to determine subterranean flow paths.

The water monitoring scheme as proposed on page 4-80 (last paragraph) of the DEIS would make it difficult to correlate impact to the Mountain Valley Pipeline. Spot sampling of wells and springs prior to and after construction is important, but karst waters can be very dynamic. Depending on timing of sampling, results

may or may not be characteristic. DCR-DNH recommends the following steps for water monitoring assessment:

1) Identify resurgence springs and other down gradient, connected groundwater for karst areas crossed by MVP using dye tracing methods
2) Perform time-series monitoring of these features by using conductivity, temperature, pressure, and turbidity probes.
3) Collect spot samples during base flow periods.
4) Evaluate turbidity response to precipitation events prior to, during, and subsequent to construction.

The emergency response plan (SPCC and Unanticipated Discovery of Contamination Plan for Construction Activities in Virginia) cited on page 4-82 would be improved by the results of dye tracing investigations performed where the pipeline runs across or above karst, in the unlikely event that contaminants enter a karst feature. Please note that this concern is not unwarranted DCR-DNH, as a fuel spill from a recent natural gas pipeline construction project in Giles County, Virginia contaminated the public drinking water supply of Peterstown, WV. The spilled fuel entered a sinkhole and came out a karst spring used as a public water supply (http://www.roanoke.com/business/pipeline-opponents-cite-contamination-of-drinking-water-supply-as-cautionary/article_1172b929-8960-54a6-abdc-1784023dd5b9.html) Had Columbia gas performed proactive hydrological studies, they would have known where the spill would go and could have informed the water system operator, as well as private well owners along the flow path

***Karst Hazards Assessment* –Attachment RR2-4a (October 14, 2016 supplemental filing-Accession number 20161014-5022)**

DCR-DNH has reviewed the Karst Hazards Assessment and offers the following comments:

- Overall, karst features that could be impacted by the project from construction, maintenance, and operation were located and evaluated, with the one significant exception of locations where the pipeline crosses perennial or intermittent channels upslope (upstream) of sensitive karst features. In such cases, the ¼ mile buffer may not be sufficient. Drainages leading to perennial or intermittent sinking streams or swallets should be identified, and measures put in place to minimize the risk of contaminant release to these channels. Primary contaminants of concern are sediment and chemicals associated with construction, particularly hydrocarbons. Such contaminants could easily travel more than ¼ mile along these channels to downstream, receiving karst features, and in turn contaminating subterranean habitats and karst aquifers that supply water to springs and wells.

- Examples of such drainages occur south of the October, 2016 (Rev 5) proposed route along the Mount Tabor alternative on the south flank of Brush Mountain (Montgomery County), along the north flank of Sinking Creek Mountain east and west of the Canoe Cave reroute (Giles County), and in the vicinity of Doe Mountain near Pembroke (Giles County.) In the Slussers Chapel Conservation Site along the Mount Tabor alternative, the proposed corridor makes 5 crossings of 4 channels that lead directly to sinkpoints just beyond the ¼ mile buffer. Such crossings are all high risk for impacts to karst systems (See **Figure 2** above).

***Karst Mitigation Plan*- RR-6 Attachment 6-D (October 23, 2015, accession number 20151023-5035)**

DCR-DNH has reviewed the Karst Mitigation Plan and supports the overall plan with the following comments:

- DCR-DNH recommends that all karst areas crossed by the corridor should be screened against existing available dye trace information to determine if the flow direction and resurgent spring(s)

are known. If not, karst areas crossed by the pipeline corridor should have flow paths delineated using tracer dye studies, unless not feasible due to geologic conditions or local nature of the karst. Such dye trace delineations are essential in effective recovery of any spill should one occur during construction, operation, or maintenance of the gas pipeline.

- In section 3.1, page 5, paragraph 1 of the Plan, MVP states "The Virginia Department of Conservation and Recreation, a division of the Department of Environmental Quality (DEQ), includes a …" The Natural Heritage Program is a division of the Department of Conservation and Recreation, which is a sister agency to DEQ.

- In section 3.5, page 10 of the Plan, MVP mentions coordination with DCR-DNH (Karst Protection) for sinkhole stabilization. DCR-DNH can provide guidance as to the basic style of sinkhole mitigation to be used, which in general is an inverted filter. However, DCR-DNH does not provide engineering drawings or a sinkhole mitigation standard. Instead some examples can be provided by DCR-DNH, but ultimately any sinkhole mitigation should be approved and stamped by a licensed geotechnical engineer.

Table 4.3.2-10-Hydrostatic Test Water Sources and Discharge Locations and 4.6.2.4 Hydrostatic Testing and Water Withdrawals

As stated on page 4-101(paragraph 1), and page 4-178 (paragraph 4), and the Erosion and Sediment Plan for Virginia, DCR-DNH supports coordination with regulatory and resource agencies in regards to water withdrawal and water discharge related to hydrostatic testing as some of the waterbodies identified in Table 4.3.2-10 support natural heritage resources such as Mason Creek-Roanoke River.

Comments on forest fragmentation will be provided by DCR-DNH to address:—Page 4-131-4.4.1.2 Interior Forest- DCR-DNH Ecological Cores referenced, Figure 4.4.1-3 Ecological Cores Map page 4-135-4.5.2.2 Forest Fragmentation and Edge Effects on Wildlife-page 4-161. As stated on page 4-150, DCR-DNH supports FERC's recommendation for "Mountain Valley to develop a mitigation plan in coordination with the federal and state agencies for both long-term and permanent upland forest impacts".

Invasive Species

Sections 4.4.2.5 and 4.4.2.4 Sections and MVP Exotic and Invasive Control Plan

On page 4-140 in Table 4.4 1-4, "Highly" Invasive Species along the Mountain Valley Project Route have been identify by MVP as classified by the DCR-DNH and WVDNR**.** This table is misidentified as only "highly invasive" species. The Norway maple (*Acer platanoides*) is included in the table and it is identified as moderately invasive according to the DCR-DNH invasive list. The invasive list in the Mountain Valley Pipeline Project -Exotic and Invasive Control Plan contains moderate to highly invasive plant species having potential to occur in the right-of-way. DCR-DNH supports monitoring for all invasive species included on the DCR-DNH invasive list post construction and supports implementation of control strategies identified on 4-149 of the DEIS and included in the MVP Exotic and Invasive Control Plan. DCR-DNH recommends the locations of the invasive species identified in Table 4.4 1-4 as "unknown" be verified for incorporation in the invasive species management plan.

On page-4-165 under Section 4.5.2.5-Wildlife, Noxious and Invasive Species it is stated the applicant will monitor for invasive species for two growing seasons and therefore there will be no anticipated impact to wildlife from noxious weeds and invasive species. Invasive species outbreaks can occur any time during construction or post construction and therefore DCR-DNH recommends the invasive species plan be implemented for the lifespan of the project as part of the right-of-way maintenance.

Virginia Department of Conservation and Recreation Conservation Area

DCR-DNH recommends changing the title of the Virginia Department of Conservation and Recreation Conservation Area to Virginia Department of Conservation and Recreation Natural Area Preserve on page 4-136 under Section 4.4.1.4 -Vegetation and on page 4-147 under 4.4.2.4 Special Areas. The Mill Creek Springs Natural Area Preserve is a portion of the overall Upper Mill Creek Conservation Site and is part of the Virginia Natural Area Preserves System established in the late 1980's to protect some of the most significant natural areas in the Commonwealth. A site becomes a component of the preserve system once it is dedicated as a natural area preserve by the Director of the Department of Conservation & Recreation, with a Deed of Dedication. Natural area dedication works in much the same way as a conservation easement by placing legally binding restrictions on future activities on a property; in this case via terms of a Deed of Dedication and an Open Space Easement. The Natural Area Preserve System includes examples of some of the rarest natural communities and rare species habitats in Virginia. This system now includes sixty three dedicated natural areas totaling 55,894 acres. DCR recommends avoidance of the Mill Creek Springs Natural Area Preserve. Activities on this Natural Area Preserve would violate the terms of the Deed of Dedication and Open Space Easement on this property. Please see the attached letter from The Nature Conservancy (landowner), which supports and urges avoidance of the Preserve, conservation sites and cave/karst features (**see Appendix A**).

On page 4-136 under Section 4.4.1.4, on page 4-253 4.8.1.6 Recreational and Special Interest Areas of the DEIS states "The MVP pipeline route would cross the Mill Creek Springs Natural Area Preserve (NAP) in Montgomery County, Virginia at about MP 223.4. The 222-acres site is owned by TNC and managed by the VDCR-DNH" as a state natural area preserve. Please note the Blake Preserve owned by TNC is the same property as the Mill Creek Springs NAP as indicated in section 3.5.1.8 Blake Preserve Variation of the DEIS. In response to FERC's request for specific comments from VDCR-DNH regarding the Blake Preserve Variation, **DCR-DNH continues to recommend avoidance of the Mill Creek Springs NAP** and requests FERC consider all alternatives in determining the least environmentally impactful pipeline route including impacts to karst.

Section 4.5 Wildlife, Section 4.7 Threatened, Endangered, and Other Special Status Species, Section 5.0 Conclusions and Recommendations

DCR-DNH supports the decision for MVP to enter into Section 7 consultation with the USFWS regarding potential impacts to and mitigation for the Roanoke logperch (*Percina rex*, G1G2/S1S2/LE/LE), Northern Long-eared bat and the Indiana Bat (*Myotis sodalis,* G2/S1/LE/LE) as referenced in section 4.7.1.1 (page 4-186) and section 5.1.7 Special Status Species (page 5-6).

DCR-DNH recommends MVP's continued coordination with the Virginia Department of Game and Inland Fisheries (VDGIF) with regards to potential impacts to and mitigation for Ellet Valley millipede (*Pseudotremia cavernarum*, G1G2/S1/NL/LT) as referenced on page 4-188, Little brown bat (*Myotis lucifugus*, G3/S1S3/NL/LE), Tri-colored bat and Northern long-eared bat as referenced in sections 4.7.1.1 including Table 4.7.1-1 and section 4.7.2.

DCR-DNH supports MVP adhering to VDGIF's Time-of-Year Restriction (TOYR) for the Orangefin madtom (*Noturus gilberti*, G2/S2/SOC/LT) and the Candy darter (*Etheostoma osburni*, G3/S1/NL/NL) as referenced in Section 4.7.1.1.

DCR-DNH supports strict adherence to erosion and sediment controls during construction activities as outlined in 4.6.2.1 Sedimentation and Turbidity on pages 4-176 thru 4-177 and the Erosion and Sediment Plan including working during low flow conditions to minimize impacts to aquatic natural heritage resources.

Upon receipt of the 2016 Portal Search/Harp Trapping Bat Surveys, the 2016 Bog turtle Survey (referenced on page 4-188) and the 2016 Loggerhead shrike survey, DCR-DNH will review the reports and provide additional comments.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR-DNH, DCR-DNH represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. Upon receipt of the 2016 Rare Plant Survey Report, DCR-DNH will review the report and provide additional comments.

4.5.1.3 Sensitive and Managed Wildlife Habitats

Virginia Department of Conservation and Recreation Conservation Areas (Sites)

The MVP October 2016 (Rev 5) route would cross the following conservation sites and natural area preserve identified by the DCR-DNH:

- Mill Creek Springs Natural Area Preserve;
- Roanoke River-North and South Forks Stream Conservation Unit
- Stony Creek Stream Conservation Unit
- Clover Hollow Conservation Site
- Craig Creek Stream Conservation Unit;
- Canoe Cave Conservation Site;
- Slussers Chapel Conservation Site
- Old Mill Conservation Site
- Kimballton Quarry (access roads)

Please note, the Elliston Glades Conservation Site is immediately adjacent to pipeyard MVP-PY-006 as identified in the October 2016, Rev 5 route.

Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural communities designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant.

SCUs (Stream Conservation Units) identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are also given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain.

DCR-DNH requests the highlighted changes be inserted into the language on page 4-158 under **Virginia Department of Conservation and Recreation Conservation Areas.** DCR-DNH continues to recommend avoidance of impacts to all of these conservation sites and stream conservation units, as well as avoidance of the Mill Creek Springs Natural Area Preserve (**see Appendix A**); support letter from The Nature Conservancy). DCR-DNH recommends coordination with the USFWS and VDGIF due to the legal status of some of the natural heritage resources associated with these sites.

5.0 Conclusions and Recommendations

5.1.1 Geological Resources, 5.1.3.1 Groundwater and 5.1.14 Alternatives

DCR-DNH supports MVP's efforts in minimizing impacts to karst resources, including incorporating numerous reroutes to avoid karst resources, developing a Karst Mitigation Plan with appropriate flexibility, preventive measures, and karst inventory work within the primary (150ft) and secondary (1/4 mile) buffers.

However, it will be difficult to accurately assess impacts to some karst resources due to the failure by FERC to require karst hydrological investigations to determine subterranean flow paths in all karst areas crossed by the pipeline, access roads, layout yards, and fueling stations. The draft EIS also fails to document places where channels terminate downstream of the project in swallets, especially in cases where swallets are more than 400ft from the project centerline. Furthermore, the well and spring sampling protocol was based on an arbitrary buffer rather than the results of a meaningful (robust, thorough) karst hydrology study. Finally, proposed spot sampling is not sufficient to characterize highly variable karst waters, particularly springs.

5.2 FERC Staff's Recommended Mitigation

DCR-DNH supports the following FERC recommendations:

5 (page 5-17) Mountain Valley shall file detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, staging areas, contractor yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary **before construction in or near that area**. Examples of alterations requiring approval include all route realignments and facility/location changes resulting from:

a. implementation of cultural resources mitigation measures;

b. implementation of endangered, threatened, or special concern species mitigation measures;

c. recommendations by state regulatory authorities; and

d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

15 (page 5-20) Prior to the end of the draft EIS comment period, Mountain Valley shall file with the Secretary the results of on-site surveys for the Mount Tabor Route Alternative to assess constructability and identify karst features that shall be avoided if the alternative is adopted into the proposed pipeline route. (*section 3.5.1.7*) DCR-DNH recommends that MVP continue to evaluate alternatives in search of one that minimizes proximity to karst features and drainages associated with the Slussers Chapel Conservation Site.

25 (page 5-22) Prior to construction, Mountain Valley should file with the Secretary the results of its fracture trace/lineament analysis for the MVP. *(section 4.3.1.2)*

28 (page-5-22) Prior to construction, Mountain Valley shall file with the Secretary HDD feasibility and geotechnical studies for the alternative alignments identified for the Pigg River crossing at MP 286.8 and the Blackwater River crossing at MP 262.8. *(section 4.3.2.1)*

30 (page-5-22) Prior to construction, Mountain Valley shall file with the Secretary, for the review and approval of the Director of OEP, the results of all remaining environmental surveys (water resources, wetlands, cultural resources, and threatened and endangered species)
for all cathodic protection groundbeds. *(section 4.8.1.2)*

35 (page 5-23) Prior to construction, Mountain Valley shall file with the Secretary Documentation of further coordination with the TNC and VDCR-DNH regarding the crossing of the Mill Creek Springs Natural Area Preserve and include any impact avoidance, minimization, or mitigation measures developed. *(section 4.8.2.4)*

41 (page 5-24) Surveys for federally listed species and consultation be complete and written notification received including conservation measures **before construction is allowed to commence.** As stated on page 5-7 (5.1.7 Special Status Species) **"**The projects could also affect twenty species that are state-listed as threatened, endangered, or were noted by the applicable state agencies as being of special concern. Based on our review, we have concluded that the MVP and the EEP would not significantly impact 10 of these species. Determinations for the remaining 10 species are pending 2016 surveys or coordination with the state agencies." DCR-DNH recommends surveys for state listed species /other natural heritage resources and coordination with state agencies be completed before construction is allowed to commence.

Revegetation
DCR-DNH supports removal and replacement of topsoil before and after construction as outlined in the FERC Upland Erosion Control, Revegetation, and Maintenance Plan, referenced in the Executive Summary (ES-4).

In regards to "Appendix N-12, Recommended Seed Mixtures, Mountain Valley Project-Virginia", DCR-DNH makes the following recommendations:

DCR-DNH does not recommend any changes for the seed mixes for the following regions/applications: Temporary Seeding All Regions, Appalachian Region & Piedmont Region – Permanent Upland Seeding Commercial or Residential, Piedmont Region –Permanent Upland Seeding High Maintenance Lawn.

Appalachian Region Permanent Upland Seeding High-Maintenance Lawn: DCR-DNH requests further information about the varieties of bluegrass that are planned for reseeding.

Appalachian Region & Piedmont Region – Permanent Upland Seeding General Slope (3:1 or less) DCR-DNH recommends these seed mixes must not contain any species listed on the Virginia DCR Invasive Plant Species List. The seed mix should be composed of the following grass species (in order of dominance in the seed mix): Little bluestem, Virginia wildrye, Indiangrass, Big bluestem, Beaked panicgrass, winter bentgrass, and purpletop. Little bluestem should be the dominant grass species in the seed mix, measuring at least 30-40% of the grasses in the seed mix. The addition of a few forbs would improve the pollinator value of this ROW. In accordance with guidelines from the XERCES Society, DCR-DNH recommends the seed mix include the following species of forbs: Lanceleaf coreopsis, common milkweed, wild bergamot, and New England Aster. Annual ryegrass should be added to the seed mix to function as a cover crop. Plant species diversity

is typically correlated with greater stability and resilience – thereby providing more reliable land reclamation.

Little bluestem is adaptable to a wide range of soil conditions (e.g., well drained, dry, infertile soil) and recommended for erosion control. Virginia wildrye tolerates a range of soil conditions & shade, so it may do well on the edges of open ROWs. It actively grows during the cooler parts of the growing season, when the native warm season grasses are not growing as much. Indiangrass can be used for critical-area seeding and on areas prone to wind erosion, and is adapted to a wide range of soil textures. If planted too heavily, it can outcompete other, shorter native species such as little bluestem. Big bluestem is recommended as a top choice for erosion control. If planted too heavily, it can outcompete other, shorter native species such as little bluestem. Beaked panicgrass grows well in 30-35% shade and prefers moist soils. It should do well in these microclimates within the ROW. Winter bentgrass is recommended on partially drained soils with partial shade. It should do well in these microclimates within the ROW. Purpletop is well adapted to shallow, droughty, infertile soils.

Appalachian Region & Piedmont Region– Permanent Upland Seeding Low-Maintenance Slope (Steeper than 3:1)
DCR-DNH recommends these seed mixes must not contain any species listed on the Virginia DCR Invasive Plant Species List; the seed mix for this region currently includes Crown vetch, an invasive species.

The seed mix should contain the following grass species (in order of dominance in the seed mix): Broomsedge, little bluestem, Indiangrass, Big bluestem, Virginia wildrye, and purpletop. DCR-DNH also recommends including the following forbs: Lanceleaf coreopsis, wild bergamot, and New England Aster. Annual ryegrass should be added to the seed mix to function as a cover crop. Plant species diversity is typically correlated with greater stability and resilience – thereby providing more reliable land reclamation. DCR-DNH recommends continued coordination with this office on seed mix varieties, application rate and other revegetation guidance.

Right-of-Way Maintenance
Right-of-way maintenance is extremely important for the continued viability of sensitive resources within this maintained habitat. DCR-DNH recommends including a robust monitoring and adaptive management plan as part of right-of-way maintenance to provide guidance if initial revegetation efforts are unsuccessful or if invasive species outbreaks occur. DCR-DNH recommends maintenance of vegetation using annual mowing in the non-growing season between 15 October and April 1 and minimal to no use of chemicals and especially in sensitive areas with documented natural heritage resources.

Thank you for the opportunity to comment on this draft environmental impact statement.

CC: Wil Orndorff, DCR-Karst
Ernie Aschenbach, VDGIF
Troy Andersen, USFWS

Appendix A

The Nature Conservancy Letter - Mill Creek Springs Natural Area Preserve (Blake Preserve)

The Nature Conservancy
Protecting nature. Preserving life.™

The Nature Conservancy in Virginia
490 Westfield Road
Charlottesville, VA 23413

tel (434) 295-6106
nature.org

July 12, 2016
Mr. Jason Bulluck, Director
Virginia Natural Heritage Program
600 East Main Street, 24th Floor
Richmond, VA 23219

Dear Mr. Bulluck:

I am writing regarding the proposal by Mountain Valley Pipeline, LLC (MVP) to route a pipeline across lands owned by The Nature Conservancy (The Conservancy) over which the Department of Conservation and Recreation (DCR) holds a Deed of Dedication and Open Space Easement.

This property is referred to by The Conservancy as the Blake Preserve in honor of the individual who donated it to us for conservation purposes, and by DCR as the Mill Creek Springs Natural Area Preserve in reference to the Upper Mill Creek Conservation Site and the Slusser's Chapel Conservation Sites in which it sits. These sites support Natural Heritage Resources[1] including Montane Dry Calcareous Forest/Woodland, and significant caves which support several rare as well as common cave species. TNC granted this easement to DCR for the preservation of Natural Heritage Resources in the public interest.

The Conservancy has asked MVP and the Federal Energy Regulatory Agency (FERC) to avoid all conservation easements, nature preserves and critical habitats for conservation including globally significant cave and karst systems.

We have expressed concerns to MVP regarding the potential impact of the project on karst features at the Blake preserve, nearby where the preferred alternative would cross. We have also expressed concerns regarding the impact of "upstream" portions of the pipeline on VOF easements, and on karst features which dye tracing studies have shown to be upgradient of the karst features on our preserve.

Paragraph 3 of the Deed of Dedication and Open Space Easement states that "as part of a dedicated Natural Area Preserve, the use and development of the Property are restricted to those activities that are consistent with the preservation of its Natural Heritage Resources." Paragraph 4 states; "No grading, blasting or earth removal shall be permitted on the Property."

In paragraph 7 of the easement, the Conservancy "reserves the rights to maintain, replace, and restore existing roads on the Property in a manner that minimizes erosion and prevents runoff into streams. The existing roads may be maintained but shall not be improved beyond the current width of fifteen (15) feet, and shall be surfaced with gravel or a similar compatible permeable material. With written approval from Grantee, segments of roads may be relocated where relocation does not materially impair or interfere with

[1] Natural Heritage Resources are defined in § 10. 1-209 of the Code of Virginia to mean "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest benefiting the welfare of the citizens of the Commonwealth";

the protected conservation, biodiversity, or natural heritage resource values of the Property. No new roads may be constructed on the Property."

Our interpretation of the language above is that allowing activities necessary to the construction of a pipeline across the property would be inconsistent with the easement.

DCR has to this point "consistently recommended avoidance of this Natural Area Preserve due to its conservation status and due to the karst features that are at risk of impacts on the Preserve.[2]" The Conservancy supports DCR's recommendation that the pipeline be sited in a way as to completely avoid the Preserve. This is necessary both for the protection of the Natural Heritage resources on the site, and as part of DCR's responsibility to uphold the terms of the easement granted it by The Conservancy.

Thank you for taking The Nature Conservancy's views into account as DCR continues to evaluate and comment on this project.

Sincerely,

Michael L. Lipford
Virginia Executive Director

Enclosures

cc: The Honorable Molly Joseph Ward, Virginia Secretary of Natural Resources
Ms. Blayne Gunderman, Environmental Services Manager, Gas Infrastructure, NEXTera Energy Resources, LLC

[2] Virginia Division of Natural Heritage. May 12, 2016. Comments provided to FERC re: the MVP

APPENDIX II

The Slussers Chapel Bypass – a possible alternative route around the Slussers Chapel Conservation Site

Wil Orndorff, VA DCR Natural Heritage
8/14/2016

Both the current proposed corridor (MVP-REV4) and the Mount Tabor Alternative (April, 2016) have the potential to seriously impact the Slussers Chapel Conservation site, which includes the Mill Creek Springs (aka Blake) Natural Area Preserve, owned by The Nature Conservancy. The Slussers Chapel Conservation Site has high global biodiversity significance (B3), as well as potential for the state endangered Ellett Valley cave millipede (*Pseudotremia cavernarum.)* Several of the rare invertebrate species in the cave live either in the cave stream, drip pools, or underground riparian areas, so protection of water quality is essential to the long-term survival of these populations. The site also has land in active conservation management by a variety of public and private conservation interests, including The Nature Conservancy, The Virginia Outdoors Foundation, The New River Land Trust, The Cave Conservancy of the Virginias, and the Virginia Department of Conservation and Recreation.

Figures 1-3 show both the MVP Rev-4 Proposed corridors and the Mount Tabor Alternative on terrain, topographic, and imagery base maps, overlain with relevant karst features and conservation land designations delineated. As proposed, both the proposed corridor and the Mount Tabor Alternative cross the center of the Slussers Chapel Conservation Site, including several tributaries to the sinking stream that enters Slussers Chapel Cave and/or Mill Creek, which sinks into the system as well. These tributaries are first and second order streams that are extremely flood prone, lying along the lower, southeastern slopes of Brush Mountain. Such areas will be difficult to revegetate and will be subject to high erosion both during and subsequent to construction.

The major factors funneling the proposed MVP route into the Slussers Chapel Conservation site are the Preston Forest and Mt. Tabor residential areas to the west, and the Brush Mountain Wilderness Area on the National Forest to the north (and east.) However, the Brush Mountain Wilderness Area is confined to the north slope of Brush Mountain. National Forest lands on the south slope have the same designation as National Forest lands crossed by the proposed corridor in the Craig Creek Valley. It seems reasonable to suggest that, on the south side of Brush Mountain, the corridor could be routed to the east at or just south of the ridge-crest of Brush Mountain, the south to rejoin the proposed route along the drainage divide that defines the eastern boundary of the Slussers Chapel Conservation Site. Routing the pipeline along or near these topographic divides would minimize the disturbance of channels, and by removing the pipeline from areas of concentrated water flow dramatically reduce the potential for erosion and sedimentation to affect the underground streams and caves of the Slussers Chapel Conservation Site. One such avoidance scenario is depicted on Figures 1-3. This or a similar modification could greatly reduce the potential impact to the Slussers Chapel Conservation site and associated lands in conservation management.

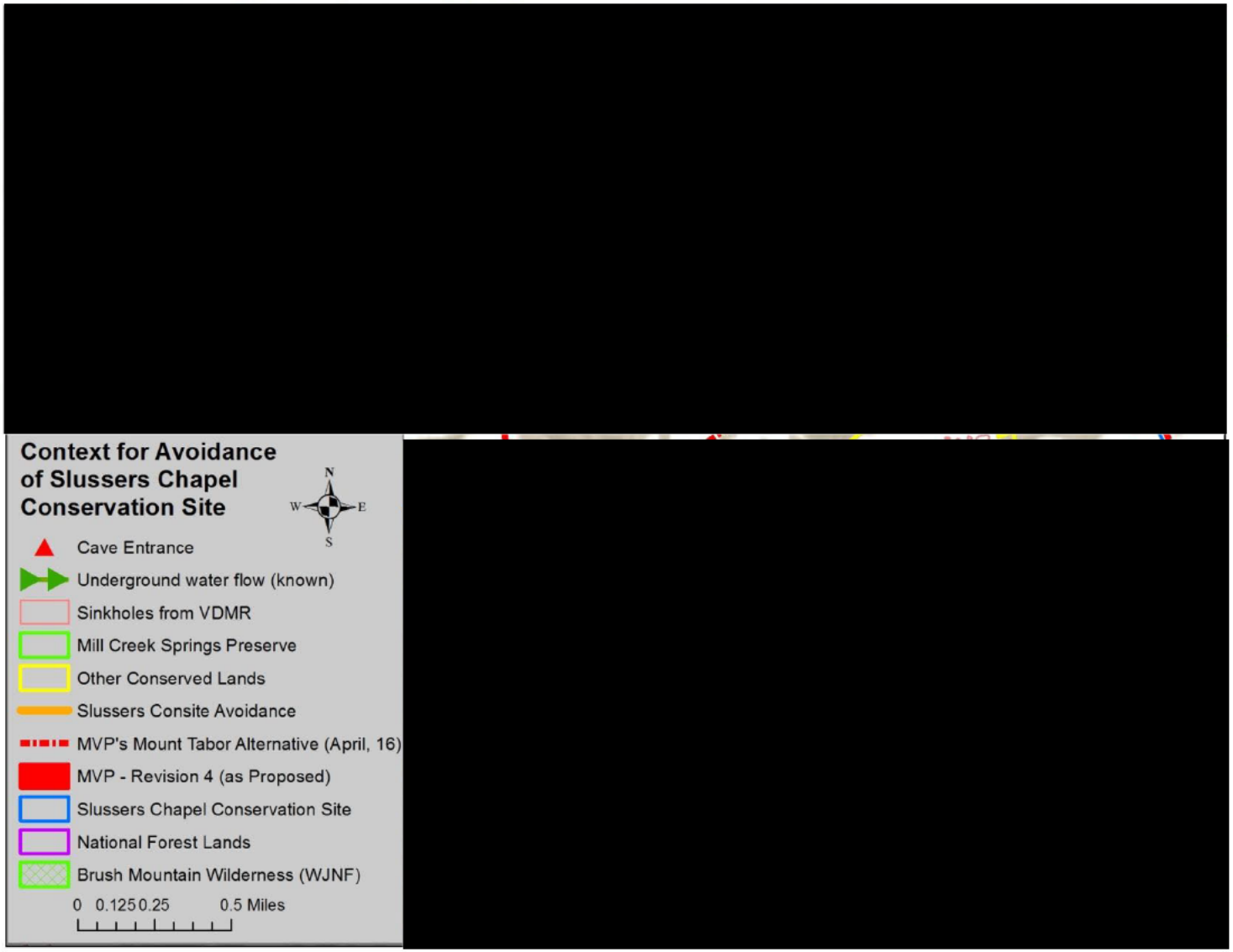


Figure 1. MVP Pipeline and Karst, Terrain Base

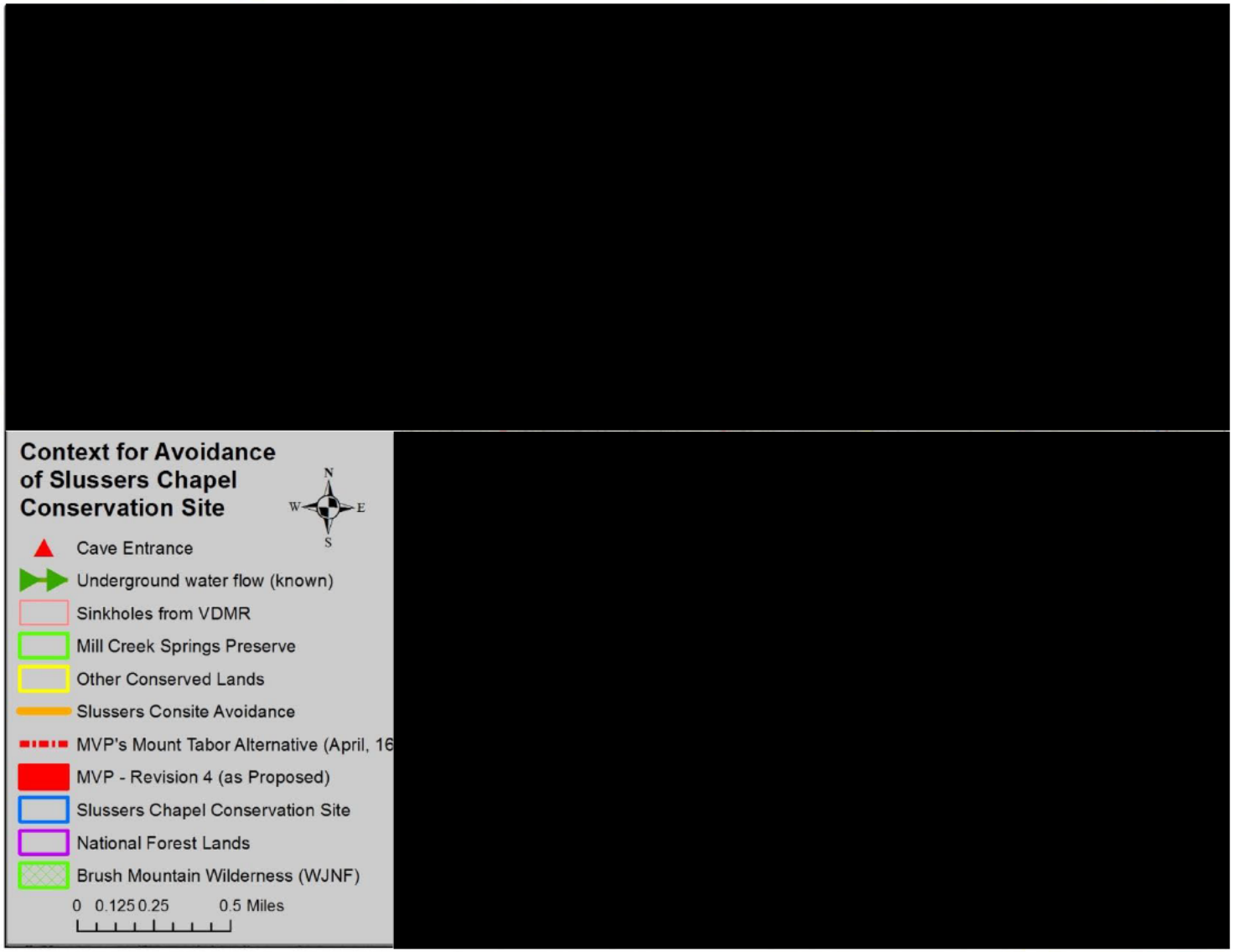


Figure 2. MVP Pipeline Routes and Karst, Topo base

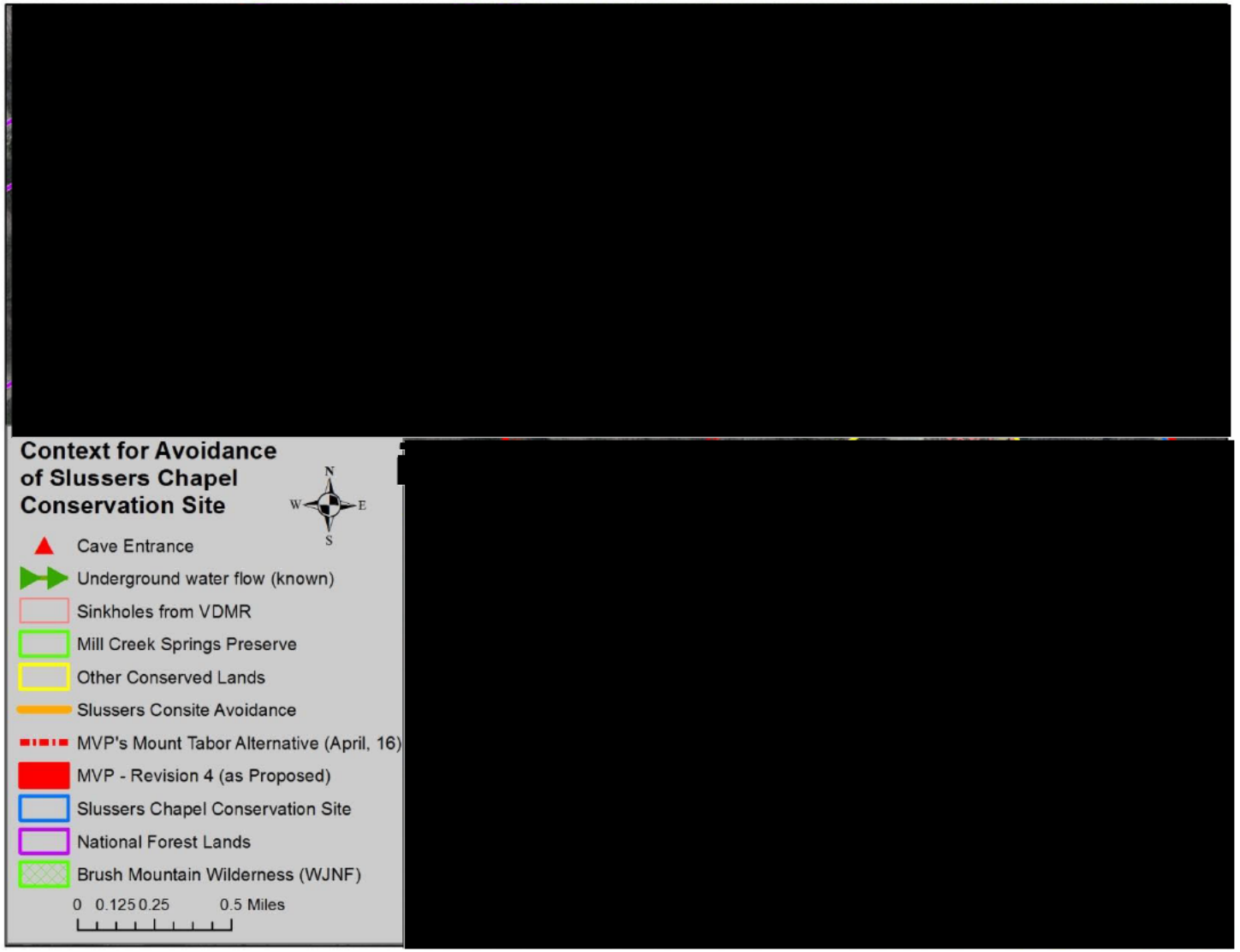


Figure 3. MVP Pipeline Routes and Karst, Imagery base

Document Content(s)