

APPENDIX F: VISUAL RESOURCE REPORT

DOOMS-BREMO 230-KV TRANSMISSION LINE EA

Appalachian National Scenic Trail, Virginia
Shenandoah National Park, Virginia

The National Park Service
U.S. Department of the Interior



Visual Resources Report

FINAL

October 2013

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EXECUTIVE SUMMARY

The National Park Service (NPS) received a proposal from Dominion Virginia Power (DVP) to upgrade a high-voltage electric transmission line on an existing right-of-way in Appalachian National Scenic Trail and Shenandoah National Park in Virginia. The existing line crosses approximately 3,000 feet of NPS property. The proposed project would remove the existing 115-kilovolt (kV) transmission line and rebuild a 230-kV transmission line between the Doods substation in Augusta County and the Bremo Substation in Fluvanna County.

An environmental assessment is being prepared to decide whether and under what conditions to issue DVP construction and special use permits to complete construction. In order to determine the baseline for visual resources, a viewshed analysis and visual survey was conducted in the area where the right-of-way crosses NPS property.

The Louis Berger Group, Inc. completed a viewshed analysis and field survey to determine where the rebuilt towers would be potentially visible. From the potentially visible and known visible areas, the NPS determined key observation points (KOPs) in the parks. KOPs are those locations considered to be visually sensitive to a visitor or viewer of the parks. Once potentially visible areas were identified, a field survey was conducted to determine if the current towers were visible and to take photographs to complete photographic simulations to determine the extent of potential visibility after the Doods-Bremo transmission line is rebuilt.

Visual impacts from rebuilding the 115-kV transmission line would be minimal. Directly under the right-of-way crossing, the rebuilt weathered steel monopole structures would be more visible given the larger size, particularly when compared to the existing wooden structures. However, when comparing the steel monopole to the other steel lattice structures in the right-of-way, this change would not lead to a large degree of further disturbance or degradation of scenic integrity.

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I. PROJECT BACKGROUND

i. Introduction to the Project

The NPS received a proposal from DVP to upgrade a high-voltage electric transmission line on an existing right-of-way within Appalachian National Scenic Trail and Shenandoah National Park in Virginia (the parks) (figure 1). The existing line crosses approximately 3,000 feet of NPS property. The proposed project would remove the existing 115-kilovolt (kV) transmission line and rebuild a 230-kV transmission line between the Dooms substation in Augusta County and the Brems Substation in Fluvanna County (the Dooms-Brems line).

An environmental assessment is being prepared to decide whether and under what conditions to issue DVP construction and special use permits to complete construction. The environmental assessment will focus on the area where the existing transmission line directly crosses NPS lands, also known as the project area. The project is located approximately 8 miles northeast of Waynesboro, Virginia, north of Calf Mountain and at the southern extent of Shenandoah National Park.

ii. Scope of Survey

The Louis Berger Group, Inc. was contracted to complete both the environmental assessment and the necessary environmental and visual surveys on NPS lands. The Dooms-Brems line crosses NPS lands in two locations, on three NPS parcels. The transmission line crosses approximately 525 feet of Shenandoah National Park land (including Skyline Drive), immediately adjacent to approximately 740 feet of Appalachian National Scenic Trail property (including the Appalachian Trail footpath). At this crossing, the existing 115-kV line is collocated with two other DVP transmission lines (one single-circuit 500-kV line and one double-circuit 230-kV line) in a 300-foot-wide right-of-way. About 1 mile east of Skyline Drive, the Dooms-Brems line crosses approximately 1,600 feet of an additional Appalachian National Scenic Trail parcel. At this crossing, the existing 115-kV line is collocated with one other DVP transmission line (one single-circuit 500-kV line) in a 250-foot-wide right-of-way. Figure 1 shows the general project location.

**Dooms - Bremo 230kV Transmission Line Project
Appalachian National Scenic Trail and
Shenandoah National Park**

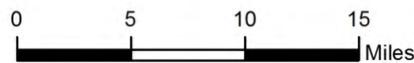
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Legend

- NPS Lands
- Appalachian National Scenic Trail
- Existing Transmission Lines**
- 69 kV
- 115 - 138 kV
- 230 - 500 kV

Figure 1: Appalachian Trail and Shenandoah National Park Crossings Overview

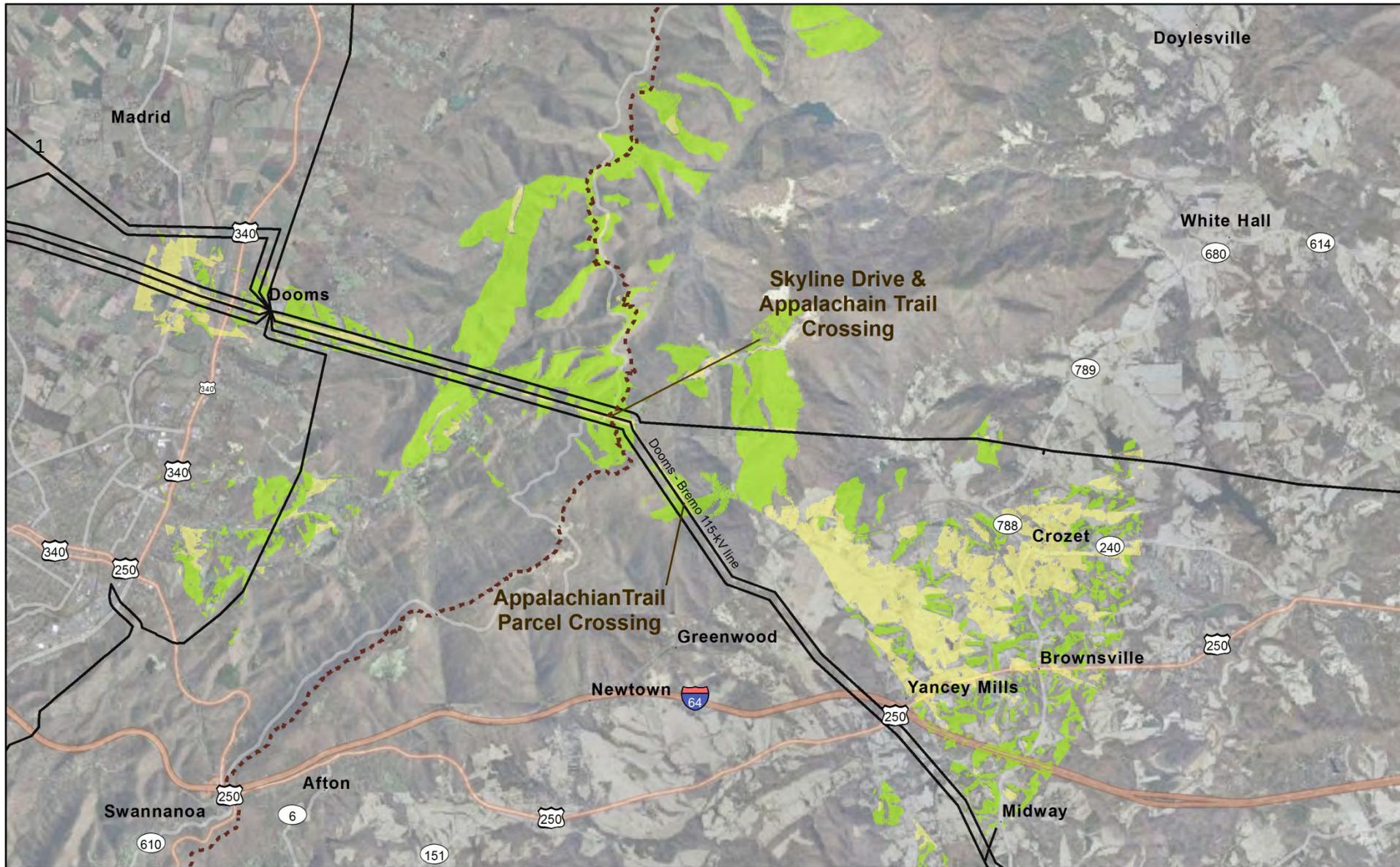


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II. SCOPE OF THE ANALYSIS

The Louis Berger Group, Inc. conducted a viewshed or a zone of visual influence analysis using geographic information system software and data to create a more focused area of potential visible impacts (figure 2). The results of this analysis identified and mapped those areas where an observer might be able to see the structures and lines given the model factors considered (described below). The areas in yellow are the areas from where it is predicted that the rebuilt towers within the parks would be visible, and the light green areas are areas from where the rebuilt towers within the parks would be visible if there were no intervening forest cover. The viewshed calculation was performed using a U.S. Geological Survey 10-meter digital elevation model, which provides an estimate of the ground surface elevation for every 10×10 square meter area. With this data source, the effects of terrain on line-of-sight visibility of an area can be modeled, allowing the identification of those areas that can and cannot be seen because of intervening topography. Vegetation was modeled by overlaying forest cover data on top of the elevation data layer, assuming an average canopy height of 19 meters or approximately 62 feet. The extent of forest cover was determined by digitizing forested areas based on 2011 imagery. The tower locations and heights were determined from information received from DVP. Engineered tower heights were provided for the towers within NPS lands; however, an average tower height of 100 feet was used for all other towers along the proposed line. The viewshed analysis determined the current visual impacts from the existing line and how the visible area would change after the towers were rebuilt. Figure 2 displays the difference or change detection of these two calculations.

Taking into consideration where the existing transmission facilities can currently be seen on the landscape and the projected change according to the viewshed, KOPs were identified. KOPs are those locations considered visually sensitive to a visitor or viewer of the parks. Eight (8) KOPs were identified as a collaborative effort between the NPS and Louis Berger Group, Inc. using knowledge of existing conditions and the results of the viewshed analysis. The survey area for visual impacts was limited to the areas determined to be potentially visible in the viewshed analysis and the KOPs (Figures 2 and 3). In general, the viewshed shows that visibility in this area will likely occur in low-lying areas such as broad stream valleys and along cleared roads or patches of land.



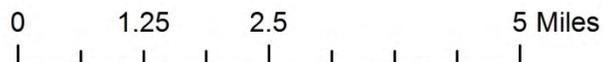
Dooks - Brems 230-kV Transmission Line Project

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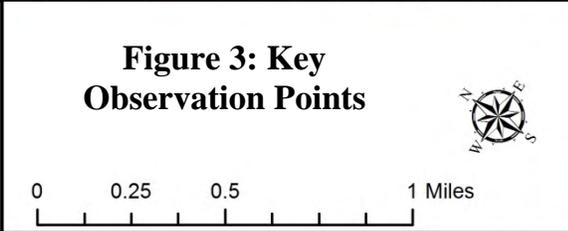
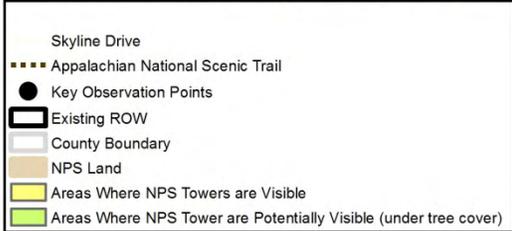
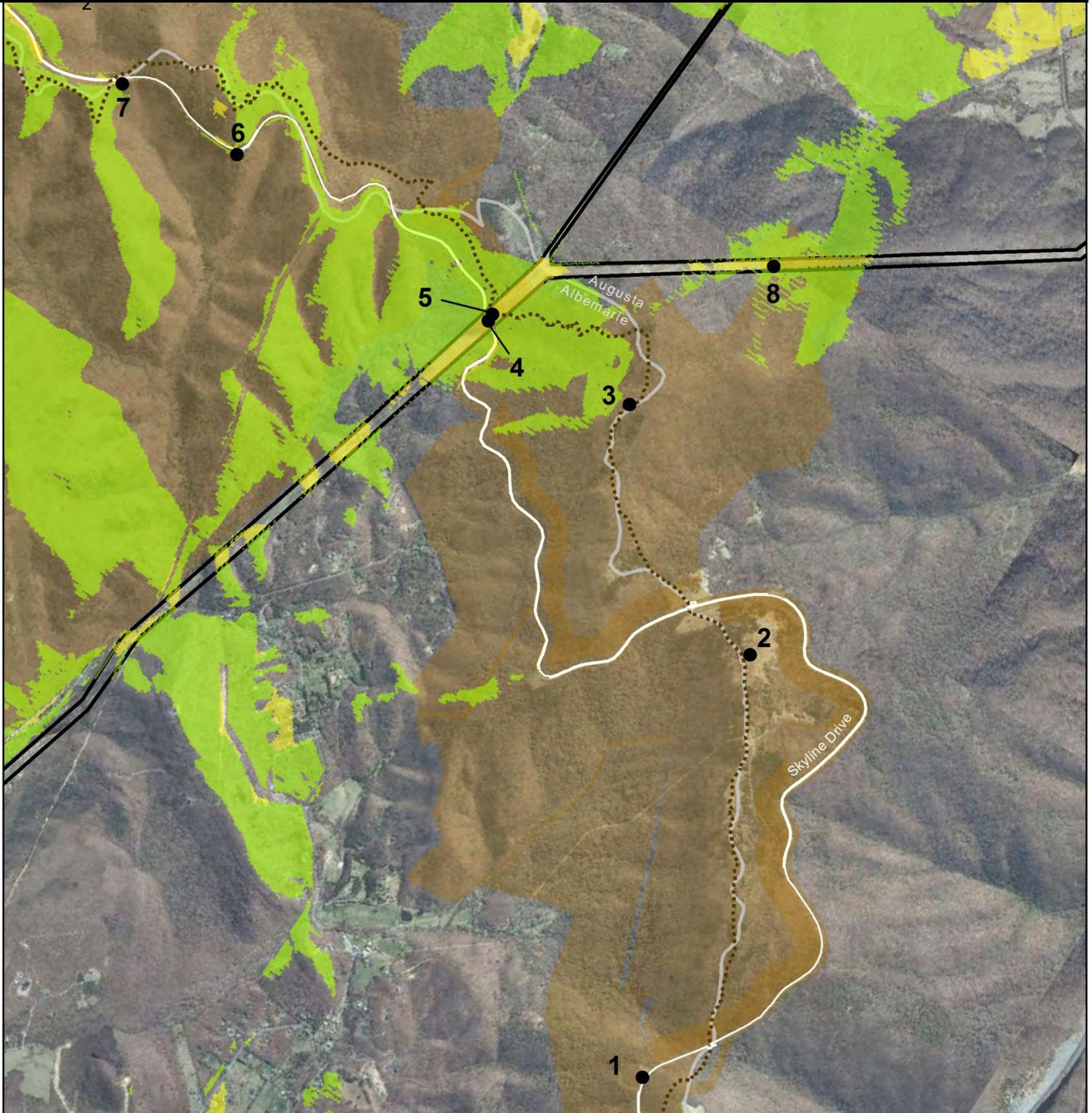


- Appalachian National Scenic Trail
- Existing Transmission Lines
- Areas Where NPS Towers are Visible
- Areas Where NPS Tower are Potentially Visible (under tree cover)
- Skyline Drive
- NPS Lands

Figure 2: Viewshed Analysis



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III. ANALYSIS

To provide an additional level of interpretation to this analysis, the viewshed calculations were also considered with respect to visual distance zones (as described in the U.S. Department of Agriculture *Forest Service Landscape Aesthetics Manual*). Distance zones are described below:

Immediate Foreground. This distance zone is 0 to 300.0 feet from the viewer. At this distance, viewers can discern individual elements of plants (leaves, twigs, and flowers), small mammals and birds, and slight movement. At this level, details are important, and all elements of a transmission line would be visible.

Foreground. This distance zone is 0 to 0.5 mile from the viewer. At this distance, viewers can discern masses of plant elements (clusters of leaves, tree trunks, large limbs, and masses of flowers), medium-sized mammals, and larger birds. At this level, movement from the wind is discernible at tree boughs and treetops. Individual forms are important, and the conductors, insulators, and structures of the transmission line would be visible.

Middleground. This distance zone is 0.5 to 4.0 miles from the viewer. At this distance, viewers can discern silhouettes of landscape elements such as tree forms, large boulders, fields of flowers, and small rock outcroppings. Form, texture, color, and pattern are important at this level. In addition, the silhouette of the transmission line structures and right-of-way clearing would be visible.

Background. This distance zone is 4.0 miles and beyond to the horizon. At this distance, viewers can discern tree groves, large forest openings, and large rock outcroppings. At this level, vertical distinctions of landforms and horizon lines provide the controlling visual character. The right-of-way clearing could be visible and possibly the mass of the transmission line structures above the tree canopy in areas where there is no background behind the structure such as along ridge tops. Throughout most of the survey area, this distance zone would not be visible due to intervening topography and vegetation.

Seldom-Seen Areas. Although this area is not a zone and has not been included within the viewshed analysis, seldom-seen areas are an important factor when discussing routing for transmission lines. Topography, vegetation, and lack of access prevent some areas from being seen by most viewers and user groups. People may occasionally view these areas while traveling off the beaten track such as hunters, off-trail hikers, utility workers, and oil and gas personnel.

i. Description of the Visual/Landscape Character

The existing right-of-way crosses NPS lands for approximately 3,000 feet and includes a total of two or three existing overhead transmission lines (depending on the location). This portion of

Skyline Drive and the trail are known for its scenic qualities and aesthetic attributes associated with the mountainous landscape and rural communities in the valley. The viewscape of a given area consists of the landforms, vegetation, water features, and cultural modifications (physical changes caused by human activities) that impart an overall visual impression of the area landscape. The area surrounding the crossing is fairly mountainous with steep changes in topography. Skyline Drive and the Appalachian Trail run mostly along ridge tops and are surrounded by dense vegetation and mature forests, with the occasional scenic overlook on Skyline Drive or open area along the trail. There are limited views of the surrounding landscape when driving on Skyline Drive or walking or hiking the Appalachian Trail in this area due to the vegetation cover.

The right-of-way clearing for the existing transmission lines exposes a landscape view of the surrounding mountainous area. The following pictures show the KOPs and various views of Skyline Drive, the Appalachian Trail, and the area surrounding the survey area. KOP 1 was taken from a McCormick Gap overlook (designated Shenandoah National Park). Wide views of the landscape are available at this location and include trees and ridges in the foreground, towns and rural development in the valley, with forested mountains occupying the background (figure 4). The existing transmission right-of-way (including all three transmission lines) is barely visible in the background at this location.



Figure 4: KOP 1, McCormick Gap Overlook

KOP 2 was taken from the Appalachian Trail in a small clearing on Calf Mountain. A site visit confirmed that the existing right-of-way and structures were not visible from this location due to dense vegetation along the trail and immediately adjacent to the clearing.



Figure 5: KOP 2, Calf Mountain, Appalachian Trail

The viewshed indicated that there may be some visibility along the Appalachian Trail at KOP 3; however, the field visit confirmed that KOP 3 was not visible due to dense vegetation surrounding the trail.



Figure 6: KOP 3, Appalachian Trail

KOPs 4 and 5 are located directly under the right-of-way, in the foreground, and have the largest views of the existing transmission lines. KOP 4 is along Skyline Drive (Figure 5) and KOP 5 is from the Appalachian Trail. The clearing of the right-of-way allows for a broad view down the western slope and overlooks a series of forested ridges. The existing structure and wires are clearly visible from Skyline Drive; however, they are not readily visible from the approach to the right-of-way due to the curvature in the road. The towers within the right-of-way are currently visible; however, the existing wooden and lattice structures quickly blend into the background as the line continues west across the landscape. The right-of-way creates a scar through otherwise forested mountains and provides a distinct alternation to an otherwise largely uninterrupted landscape.



Figure 7: KOP 4, Views from Skyline Drive Looking West (Top) and Northwest (Bottom)

KOP 5 is located along the Appalachian Trail. When walking along the Appalachian Trail across the right-of-way, the surrounding area appears open due to the cleared vegetation and the lack of forest canopy. However, the tree canopy is so dense surrounding the Appalachian Trail that the

right-of-way and towers are not visible, approaching from the north or south, until immediately under or at the edge of the right-of-way (figure 6).

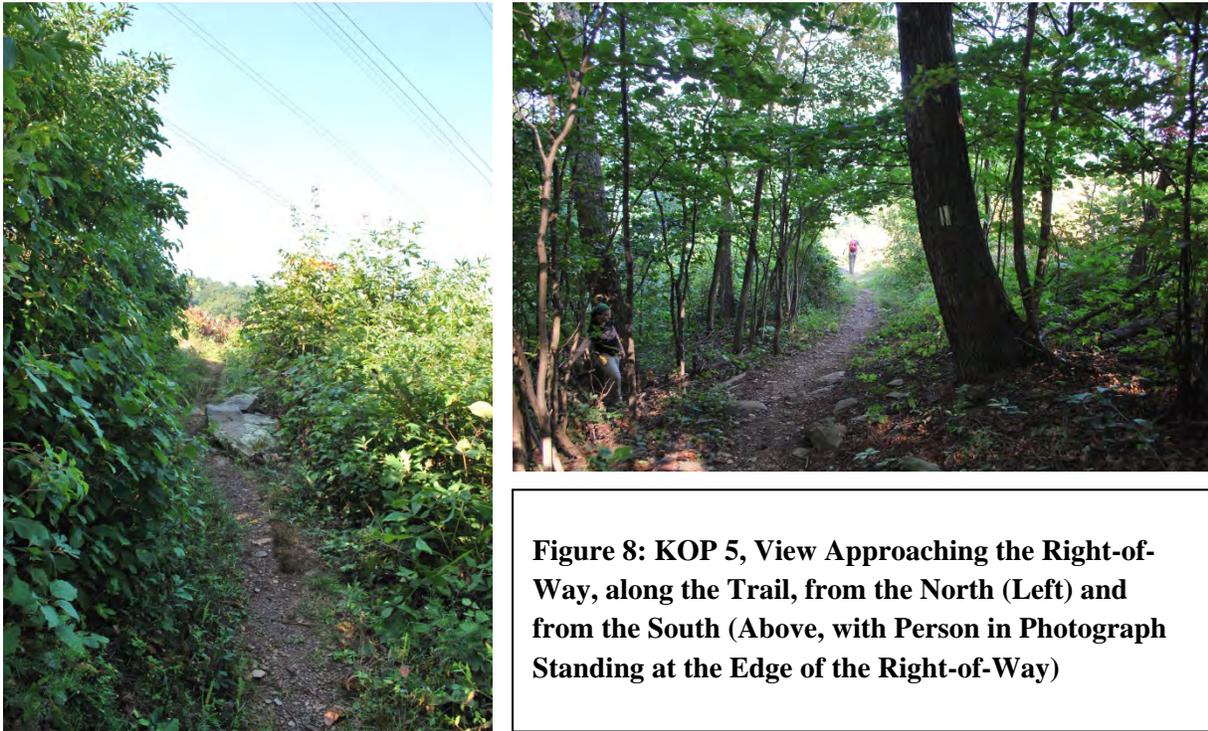


Figure 8: KOP 5, View Approaching the Right-of-Way, along the Trail, from the North (Left) and from the South (Above, with Person in Photograph Standing at the Edge of the Right-of-Way)

From within the right-of-way, the lines are very visible, particularly the existing 500-kV structures, given the size and proximity to the Appalachian Trail. The 115-kV Doods-Bremo line is located upslope from the Appalachian Trail and farther from the footpath. The cleared right-of-way allows for wide views looking down over Skyline Drive, the right-of-way as it continues west over the mountain, and the surrounding forested ridgelines.



Figure 9: KOP 5, View from the Trail within the Right-of-Way, Overlooking Skyline Drive (Top) and Looking Back at the Existing 115-kV Line (Bottom)

KOPs 6 and 7 are located on the Sawmill Overpasses along Skyline Drive. The viewshed indicated that the transmission facilities may be visible from these overlooks. The designated overlooks offer broad views of several forested ridgelines in the foreground, middle ground, and background. The existing transmission line sits between the ridge in the foreground and the middle ground, greatly limiting potential views of the existing transmission lines. The field review confirmed that there is a ridge between the location of the right-of-way and the location of the overpasses, greatly limiting views of the existing transmission facilities. Some of the existing lattice towers on the 230-kV or 500-kV transmission line were slightly visible from the overpass, but they were only detectable if a viewer was actively looking for the structures on the landscape. Furthermore, these structures are not visible in photography of the landscape (figure 8).



Figure 10: KOPs 6 and 7, Views of the Landscape from the Sawmill Run Overlooks

KOP 8 is located on the southeastern parcel on Appalachian Trail land (not along the trail) and includes heavily forested mountainous landscapes with views of the rural valley in the distance, only visible due to the current right-of-way clearing. This portion of the park is considered a seldom seen area, does not have any recreation, and is highly unlikely to have any visitors who would see the transmission line from this location (figure 9).



Figure 11: KOP 8, Southeast Parcel of Appalachian Trail Land

ii. Proposed Transmission Structures

DVP plans to remove the existing wooden H-frame structures and replace them with weathered steel monopole towers. The typical structure is shown to the right in figure 12.

iii. Potential Viewers and Sensitivities

A viewer is an important factor that influences potential visual impacts of a project. A viewer is defined not only as the person who is viewing the line but also as their expectations, activities, and frequency of viewing a scenic resource. One type of viewer, recreational users, was identified within the project area. Recreational users in the area pay to access Skyline Drive or hike all or portion of the Appalachian Trail.



Figure 12: Example of Typical Weathered Steel Monopole

iv. Scenic Integrity and Visual Absorption

Scenic integrity is the degree by which the landscape character deviates from a natural or natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As manmade incongruities are added to the landscape, the scenic integrity diminishes.

In addition, some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. The character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes in landscape. A new transmission line next to an existing line provides less contrast and therefore can be absorbed into that landscape better than introducing a transmission line as a new feature in a previously undeveloped area. Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities are more likely to blend in with surroundings where existing facilities exist and would not change the integrity of the landscape.

The scenic integrity of the existing right-of-way crossing of NPS lands is very low. Three existing transmission lines are within the right-of-way and currently disrupt the landscape. The rebuild of the wooden H-frame structures with weathered steel monopole structures would not further degrade the integrity of the landscape at this location. No pristine, uninterrupted landscapes would be disturbed as part of the rebuilding of the transmission line project.

IV. KEY FINDINGS

Photographic simulations were completed for the above-described KOPs and are presented in Appendix A. The photographs selected for simulation demonstrate what was perceived to be representative photograph of the identified KOP. For each view chosen for simulation, a three-dimensional rendering was created to simulate the proper tower height, type, and location for the rebuild by mimicking the viewing perspective of the photograph. With the towers oriented properly in space, a virtual camera was set up in the same three-dimensional space at the photographer's height and location relative to the proposed line. The virtual camera's focal length and point of view were set to those of the camera that took the photograph to obtain the correct perspective. Light sources were set up to simulate the lighting conditions (the sun placement and time of day) and look of the towers in the photograph. Once the perspective and sizing was correct, the three-dimensional rendered structure was placed in the digital photograph. The process of photo-simulation was accompanied by a collaborative review to ensure that the simulated towers appeared the way it should in the photograph. Several staff reviewed each photograph to comment on the perspective and look of the simulation so that any necessary alterations could be made to fairly represent the way in which the towers would likely appear after the transmission line was rebuilt.

The simulations demonstrate that views of the rebuilt transmission line from the KOPs are very limited, with the exception of the area directly under the right-of-way. Views from the Sawmill Run and the McCormick Gap overlooks have very limited views of the towers as a result of intervening topography and tree cover. Furthermore, the views from those locations are currently impacted by the existing 500-kV and 230-kV structures, which are taller, on average, than the proposed Dooms-Bremo 230-kV transmission line towers.

The current right-of-way crosses Skyline Drive and the Appalachian Trail at a perpendicular angle, limiting extended views of the transmission lines. Travelers on Skyline Drive and the trail would likely see the transmission lines only transiently when immediately approaching and directly underneath the right-of-way. Exposures to the line would not occur for long periods of time or for long distances. It would take a driver less than 10 seconds to drive and a hiker on the Appalachian Trail approximately 5 minutes, depending on walking speeds, to move through the affected area. Given the brief period of exposure and existing conditions, visual impacts are expected to be minimal. The rebuilt weathering steel monopoles would be more visible and taller than the currently existing wooden monopole structures; however, given that the adjacent 500-kV and 230-kV lattice structures are taller and larger than the proposed structures and weathering steel is being used, the scenic integrity of the affected area would not be further degraded.

V. CONCLUSIONS

Visual impacts as a result of the rebuilding of the 115-kV transmission line would be minimal. Directly under the right-of-way crossing, the weathered steel monopole would be more visible given the increased height; however, when comparing the weathered steel monopole to the other steel lattice structures in the right-of-way, this change would not lead to a large degree of further disturbance or degradation of scenic integrity.

VI. RECOMMENDATIONS FOR SPECIFIC MITIGATION MEASURES

Given the extent of existing visual impacts, there is little mitigation potential. Low-growing vegetation can be planted along the trail and in the foreground of a hiker in order to block expansive views of the right-of-way and existing facilities. The steep topography to the east of the trail and Skyline Drive raises the towers out of the immediately line of sight, requiring a visitor to look up to see the proposed Dooms-Bremo line. Vegetation to block the view would be most effective if planted on the western side of the right-of-way at the trail and Skyline Drive.

VII. LIST OF SURVEY PERSONNEL

The Louis Berger Group, Inc.

Emily Larson: An environmental scientist with more than 5 years of experience in environmental sciences and regulatory compliance for both private and federal clients, primarily relating to utilities and infrastructure planning.

Rudi Byron: An environmental scientist with more than 7 years of experience in environmental sciences and regulatory compliance for both private and federal clients, primarily relating to the National Park Service and Department of Defense compliance.

Brent Allen: Former NPS compliance specialist.

VIII. REFERENCES

U.S. Department of Agriculture - U.S. Forest Service (USDA-FS). 1995. Landscape Aesthetics. A Handbook for Scenery Management. Agricultural Handbook Number 701. Washington, D.C.