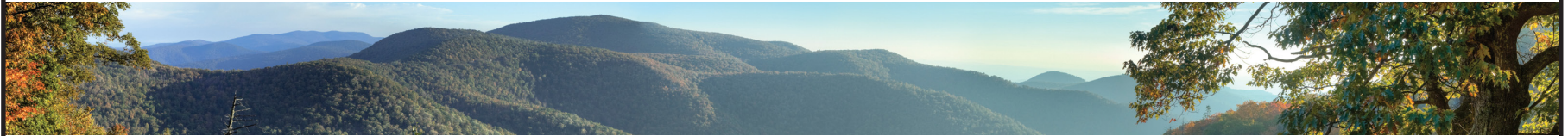


Pipeline Reports: A Special Series

Let's talk about karst topography.

To begin to understand karst topography, you need to look at how the ground surface has reacted to changes in the underlying bedrock over 100,000s of years. To learn how the Mountain Valley Pipeline (MVP) will address challenges posed by the karst, the answers begin with a sequence of expert evaluations, analyses, and recommendations.



The MVP project includes a proposed interstate underground pipeline that will transport natural gas from the Marcellus and Utica shale regions through West Virginia and Virginia to energy consumers along its approximately 300-mile route and then access existing infrastructure to provide natural gas to the nation's Mid-Atlantic, Southeast, and Appalachian regions. The project is subject to approval and regulatory oversight by the Federal Energy Regulatory Commission (FERC).

MVP project planners understand and respect the issues related to karst topography; and they rely on the knowledge and expertise gained through the prior construction of thousands of miles of pipelines – which were constructed safely and now operate safely in regions across the United States where karst exists. The MVP planners will exercise great care based on extensive research conducted by teams of engineers and scientists, using state of the art technologies with foot-by-foot diligence, to understand karst features prior to construction and to develop plans to safely construct and operate the pipeline in these areas.

So, what is karst? Karst terrain forms when rainfall and snowmelt percolate through soil into limestone and dolomite, dissolving away the minerals to form larger and larger conduits over time. When a conduit becomes big enough it is called a cave. Sometimes, the percolating water carries soil into the conduit and forms a sinkhole.

Karst features are most visible at the ground surface in the form of sink holes. Underground caves are a spectacular example of karst, and can host a variety of unique species. Because water in karst terrain may flow quickly through enlarged conduits, it is vulnerable to pollution transport. Given the porous and changing



nature of karst topography, and its value to the environment, the MVP project team is committed to developing and implementing an effective karst mitigation plan.

It's important to understand that karst terrain does not preclude construction of a pipeline. Karst exists across the U.S., beneath approximately 40% of the lands east of the Mississippi River, where several thousand miles of pipeline have been constructed and continue to operate safely. The key is to identify sensitive karst features and water resources, take steps to protect or avoid them, and have a mitigation plan in place.

The MVP project team hired Draper Aden Associates, an environmental engineering, surveying, and design firm based in Blacksburg, Virginia, to study the project's route and provide their expertise in identifying karst features, protecting karst topography, and developing a pipeline construction and mitigation plan specifically for karst construction in this region.

"The challenges posed by karst range from risks to natural cave habitats to groundwater resources to potential effects of subsidence on the pipeline itself," said William Newcomb, P.G., Project Manager, Draper Aden Associates. He added, "We will analyze geologic documentation and conduct extensive field evaluations to identify sensitive karst features in order to develop a strategy that provides for the safe construction and operation of the pipeline, while also allowing nature to continue to define the evolution of the region's karst landscape."

Michael Futrell, a Draper Aden Associates Spatial Analyst specializing in karst environments said "We will make recommendations to avoid sensitive karst features and minimize changes to the existing surface water flow patterns." The MVP team will conduct a thorough analysis to address storm water runoff, and erosion and sediment control in accordance with local, state and federal requirements during construction and after reclamation. Additional measures to control water runoff and sediment transport will be implemented in the vicinity of sensitive karst features. "We will provide recommendations for controlling surface water and minimizing sedimentation that may flow toward sensitive karst features," Futrell added.

Existing geologic studies and mapping, detailed field inspections, and the expertise of MVP's technical team will be used to understand potential impacts to water resources. Based on review of geological data and ongoing field reconnaissance, MVP and Draper have concluded that approximately 30 miles of the proposed pipeline route crosses karst areas. Continuing studies and surveys will provide the information necessary to develop environmentally protective construction and safety plans in areas where karst is present.

The safety of our communities, our employees, our contractors, and our pipeline will always remain a top priority – as will the preservation and protection of the environment. These are the standards we live by every day, reinforcing what we mean when we say we're completely committed to building the Mountain Valley Pipeline safely and responsibly. Nothing is more important to us.