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Presentation Title:	**Leveraging Options:** **ASR as a Water Supply Management Tool**
Category:	**Track D - Water Use Management and Permitting;** **Group - Surface and Groundwater Management**
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Extended Abstract:

Over the last 20 years, several water-supply utilities in the Coastal Plain of South Carolina and North Carolina have recognized the benefits of storing and recovering treated drinking water in aquifers as a management tool for water supply. This practice has been defined as aquifer storage recovery (ASR).

Numerous factors have led water-supply managers to consider this option. These include:

- **Drought** – The State of SC has been experiencing below average rainfall conditions for 8 of the last 10 years. During this period, potentially critical low water supply levels have been recorded in several areas of the state. The large storage capacity of aquifer systems makes ASR an attractive option for developing emergency water supplies.

- **Competition for water supply sources** – South Carolina receives surface water flows from North Carolina through the Pee Dee River, the Catawba River and the Broad River. Recent drought conditions have highlighted the importance of adequate flows reaching South Carolina. In addition, South Carolina shares the Savannah River with the State of Georgia. Recent restrictions by the EPA have highlighted how critical this resource is not only for water supply but also for wastewater discharge. Capturing and storing portions of the water supply that would normally be lost to ocean discharge improves the efficiency of resource use.

- **Financial impacts of system expansion** – Constructing capital improvements to meet future demands can be expensive. By leveraging the option of ASR, water supply systems can operate treatment facilities more efficiently by minimizing the fluctuations in the typical seasonal demand. The typical seasonal demand is higher during the warm summer months and low

during colder winter months. By increasing production during the cold weather and storing this water for recovery during the warmer periods, systems can operate at a more consistent rate year round. This means that production doesn't have to be ramped up during high demand periods. Excess demand can be met by strategic location of ASR facilities. This can allow system to delay or potentially eliminate expansion of facilities to meet peak demands.

- **Water quality** – ASR can be used to help improve water quality in several ways. One method is by blending water stored in an ASR system with treated water at the point of entry of a distribution system to help reduce disinfection by-products (by dilution). This approach can also apply to water sources that have issues with manganese. Another method is to install ASR facilities in the distribution system and backfeed the system, thereby reducing the water age in the system and the potential for disinfection by-product formation.

- **System reliability** – Similar to the drought application, storing large quantities of supply for future use can improve the reliability of a water system to provide uninterrupted service to customers. Depending upon aquifer characteristics, ASR systems can typically store an order of magnitude more water than above ground storage systems.

Currently, five water supply systems on or near the Carolina coastline have operating ASR systems (Grand Strand Water and Sewer Authority, Georgetown County Water and Sewer District, Mt. Pleasant Water Works, Kiawah Island Utilities, and Beaufort Jasper Water and Sewer Authority). Three other utilities (Greenville Utilities Commission, Greenville, NC; City of Wilmington, NC, and Department of Public Utilities, Orangeburg, SC) are constructing ASR systems.

If a utility feels that ASR may be a potential solution / management tool that should be considered, the most efficient first step is to conduct a feasibility study to get an idea of how much capacity (storage and production) is needed and compare that with how much is available. During a feasibility study, existing data are reviewed to estimate these quantities. Other factors considered during a feasibility study are the potential applications desired by the utility. In many cases, the type of application can determine the location of the ASR facilities.

If the feasibility study determines that ASR is a viable option, then the next step is to proceed with construction of the ASR facilities. Depending upon the existing data available, construction of the production wells may need to be preceded by the drilling of a core hole to collect samples of the hydrogeologic characteristics of the aquifer(s) being considered for ASR. In some cases, data collected from the drilling of monitoring wells can be used to define these characteristics. Data from the core hole / monitoring wells are used to design the full scale ASR well(s).

Once the production wells are completed, they are then developed during several cycles. The amount of cycles required for proper development can vary based upon site specific conditions. Following completion of cycle testing and well development, the ASR facility is then ready for use.

Using examples from South Carolina and North Carolina, this presentation discusses factors that should be considered in evaluating the feasibility of ASR for municipal supply systems, and how these factors have impacted the application of ASR for water supply systems in the region.

Presenter Bio: Porter Rivers, III, P.E.

Porter Rivers is a Senior Associate with BP Barber and a registered PE in Florida and South Carolina. He has been with BP Barber since 1994. He has a BS in Chemical Engineering from the University of South Carolina with an MS in Environmental and Civil Engineering from Colorado State University.

His primary responsibilities at BP Barber include participation in projects related to water resources planning as well as water treatment process analysis and design. He served as BP Barber's project manager for the Feasibility Evaluation of ASR in Wilmington NC and Orangeburg SC. He is currently participating on the engineering team for construction of ASR facilities in Wilmington and Orangeburg.

He is currently serving on the Water Resources Committee and the Partnership for Safe Water Committee for the South Carolina Section of AWWA.