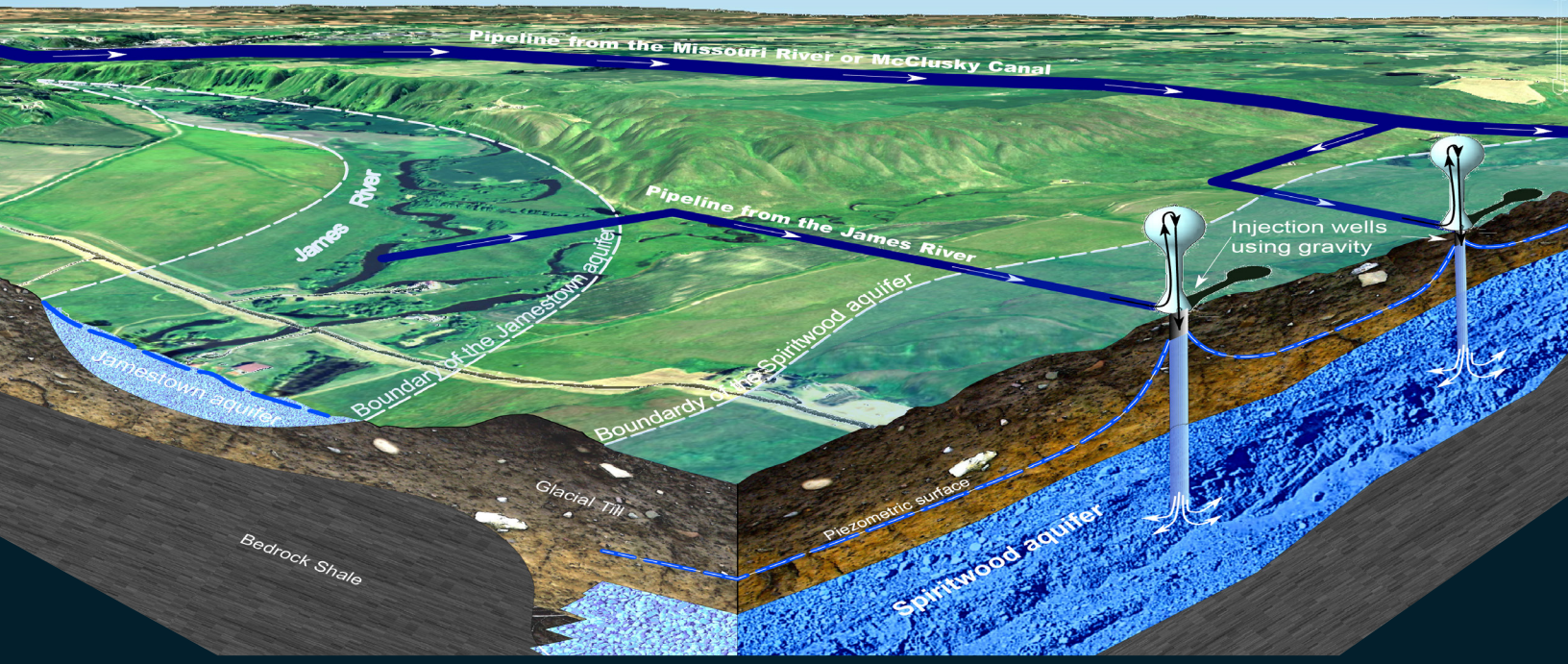
The Oxbow
FROM THE NORTH DAKOTA STATE WATER COMMISSION

Currently, the SWC has an initiative to develop a pilot project to use Aquifer Storage and Recovery (ASR) in the Spiritwood aquifer near Jamestown. "The pilot study involves a focused analysis of the potential geochemical evolution through desktop modeling followed by a real world test," said Dave Hisz, SWC hydrologist and project manager for the area. As a first step, the SWC has engaged Dr. Scott Korom, of Barr Engineering, to evaluate the potential geochemical changes likely to be encountered when mixing James River water with the Spiritwood aquifer water. A small-scale pilot project to test the practical feasibility of injection in the Spiritwood aquifer is in the planning stage.



USING OUR AQUIFERS AS RESERVOIRS

Aquifers are bodies of permeable earth materials that store and transmit water. In essence, they are the containers in which our groundwater is stored. When aquifers approach their limits for sustainable development, surface water can be used to enhance water supplies via a process called aquifer storage and recovery (ASR). ASR involves diverting water from rivers and streams during periods of high flow and placing it in aquifers for storage and later use. The use of ASR can help bridge the gap between supply and demand.

Jon Patch, Water Appropriation Division Director, frames the challenge of water supply like this, "North Dakota has no mountains to hold storehouses of snow like our neighbors to the west. We are not the land of 10,000 lakes or bordered by the Great Lakes like our neighbors to the east. We have no Ogalala type aquifer with nearly unlimited saturated thickness to tap into for a fresh water supply like the states to the south of us. But, beneath the plains of North Dakota are numerous aquifers – sand and gravel deposits – left behind after

History Of ASR In North Dakota

ASR project in Grand Forks County where as much as 1,000 acre-feet per year is added to the Inkster aquifer through an infiltration basin. Water is pumped from the nearby Forest River when flows are high in April to June and later extracted from the aquifer during the irrigation season.

ASR has been used, or in some cases evaluated for project use, at various times in the state's history. Valley City diverted spring Sheyenne River water to augment its groundwater supply during the 1930s. The project was discontinued when wetter conditions resumed. During the 1950s, Minot diverted water from high flows in the Mouse River to replenish the Minot aquifer. The project was discontinued after sediment deposits slowed infiltration to impractically low rates. The Oakes Test Area, in Dickey County, temporarily used surface infiltration of spring high flows in the James River to store water in the Oakes aquifer for irrigation use during the 1990s. Surface applications were discontinued after completion of the test project.

A field-scale test of the feasibility of using ASR through infiltration basins, managed for long-term sustainable use, was conducted by the State Water Commission (SWC) and the U.S. Bureau of Reclamation during the late 1980s, with the intention of potentially using the technology as a reservoir for Garrison water to operate the Oakes Irrigation Project. Tests indicated that ASR would be feasible, but the project itself was not completed. Feasibility of using ASR to replenish the Englevale aquifer from the Sheyenne River for irrigation use was studied during the early 1990s, but found to be cost prohibitive for irrigation use. Since 1993, the Forest River Hutterite Community has successfully diverted spring high flows in the Forest River for ASR through an infiltration basin, storing as much as one-thousand acre-feet per year for irrigation use.

According to William Schuh, current Assistant Director of the Water Appropriation Division who has been involved in ASR research since he started working for the SWC in the mid 1980s, "Use of ASR is not without its challenges. Fine sediment in surface water clogs the aquifer pores during infiltration or well injection, and must be managed or removed. Deep injection requires removal of sediments. Hydro-chemical effects of mixing surface water with groundwater must also be understood and managed." These possibilities must be carefully studied, minimized through appropriate management, and monitored to assure the effectiveness of management.

multiple glacial advances and retreats leveled our beautiful state like a rolling pin over dough, the last of which occurred about 10,000 years ago. The source of about half of the total developed fresh water use in our great state is from these glacial aquifers and many of them are nearly fully appropriated."

When compared to the regional aquifers that exist in many other states, North Dakota's glacial aquifers are relatively thin and shallow. These glacial aquifers are typically replenished through precipitation and snowmelt percolating their way downward through the overlying sediments. In the case of many glacial aquifers buried by tens of feet of clay and silt, recharge is relatively low. Current and prior development of these aquifers has lowered the water levels to the point that further development for beneficial use is limited. However, Jon Patch points out that "these heavily developed glacial aquifers are now great candidates to serve as storage reservoirs for abundant surface water that flow in nearby rivers and streams, especially during periods of high-flow during the spring and early summer."

ASR is used as a water management tool in many of the western states where demands in certain locales exceed the naturally available supply. ASR has great potential for North Dakota as well, and could help alleviate our challenges of growing demand and limited spatial and/or temporal supply. Some of the aquifers under current consideration are the Spiritwood aquifer in the Jamestown area; the West Fargo aquifer, which is deeply buried and has almost no annual natural recharge; and the Wahpeton Buried Valley aquifer, which is under high demand for beneficial use.

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