The Feasibility of Utilizing Produced Water to Improve Drinking Water Supply in Southeastern New Mexico

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The Driving Issue and What We Did Persistent water scarcity and increasing demands for freshwater in Eddy and Lea Counties of southeastern New Mexico creates a need for consideration of alternative water sources. At the same time, the region's oil and gas industries devote considerable financial resources to managing greater than 100,000 acre-feet per year of produced water that is co-produced during oil and gas extraction. The oil and gas industries are paying a premium for freshwater to use in hydraulic fracturing. This co-produced water could be put to multiple potential uses provided that decision-makers and stakeholders have vital information including spatial distribution, water quality and volume, geochemical composition, regulatory framework, water quality thresholds for different potential uses.

Our research group addressed these information needs by compiling produced water quality and volume data into a searchable database and web-mapping applications, analyzing the produced water quality data to produced information on the geochemistry, providing an analysis of the regulatory framework surrounding produced water, reviewing current and emerging treatment technologies, and compiling information on potential use thresholds.

Major Accomplishments and Findings

- Updated online produced water quality database: http://octane.nmt.edu/gotech/Water/producedwater.aspx
- Improved understanding of the geochemistry of produced water in three sub-basins of the Permian Basin
- Identified depths and areas of Total Dissolved Solids (TDS) that may be more suitable for treatment for reuse
- Developed decision-maker accessible web-map applications to explore produced water quality and volume data
- Reduced the regulatory uncertainty through review of relevant regulations surrounding produced water
- Regulatory analysis identified that no permit from Office of the State Engineer (OSE) is required for the disposition of produced water, thus clarifying that no water right is acquired through the disposition by use of produced water at any time, regardless of the type of use or whether the produced water is treated.
- New Mexico Oil Conservation Division (NM OCD) remains the permitting authority for the disposition of produced water, however, consultation with New Mexico Environment Department (NMED) is necessary prior to reuse outside the oil and gas industry.
- The treatment technology analysis highlighted that the high average TDS of produced water (approximately 70,000 mg/L) in Eddy and Lea Counties makes most treatment technologies economically infeasible, however, thermal desalination and forward osmosis are possible options for produced water with high TDS.
- Reuse within the oil and gas industry is the most feasible option for reuse, while reuse for agriculture, potash mining, or stream augmentation will require tailored treatment of the produced water to achieve specifically desired water quality.
- Three rounds of community meetings in Eddy and Lea Counties with high stakeholder engagement were held.

Produced water database contains over 6,000 water quality samples from the Permian Basin Region.

Data added to the database helped fill in areas that were lacking coverage

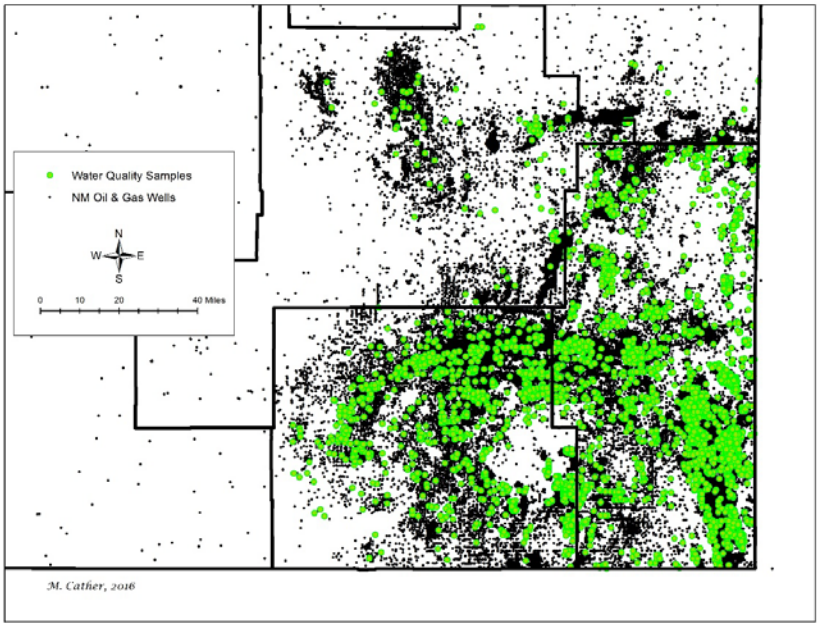

Figure 1. Distribution of produced water quality samples as compared with overall distribution of oil and gas wells in southeastern New Mexico.

Water is regulated by three agencies in New Mexico

Authority over produced water disposition is by NM OCD

Consultation with NMED is necessary prior to reuse outside the oil and gas industry

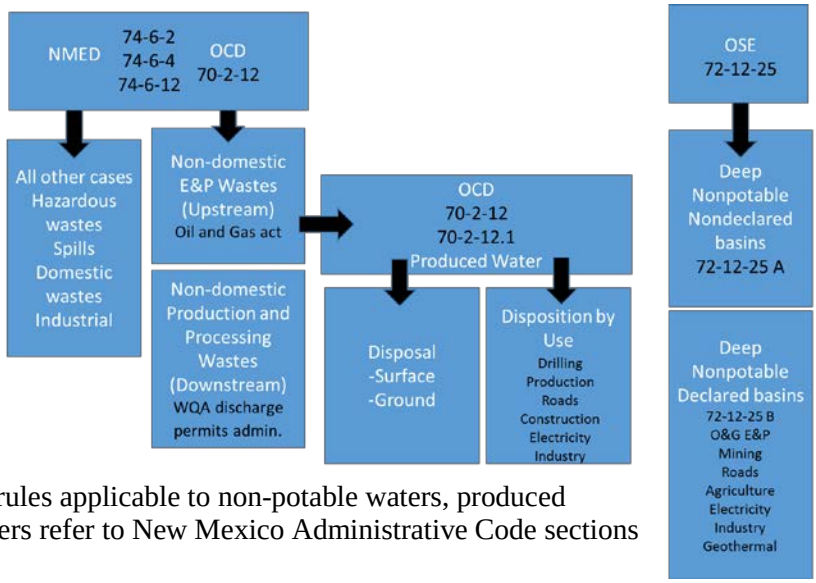

Figure 2. Schematic of jurisdiction and rules applicable to non-potable waters, produced waters, and all other water cases. Numbers refer to New Mexico Administrative Code sections

One of the drivers produced water reuse feasibility is available treatment technologies and associated costs

While many technologies can treat produced water, most cannot do so while maintaining cost efficiency

Produced water in Eddy and Lea Counties would most likely use Seawater Reverse Osmosis or Electrodialysis treatment for waters with TDS < 40,000 mg/L, and thermal and emerging technologies for higher TDS water

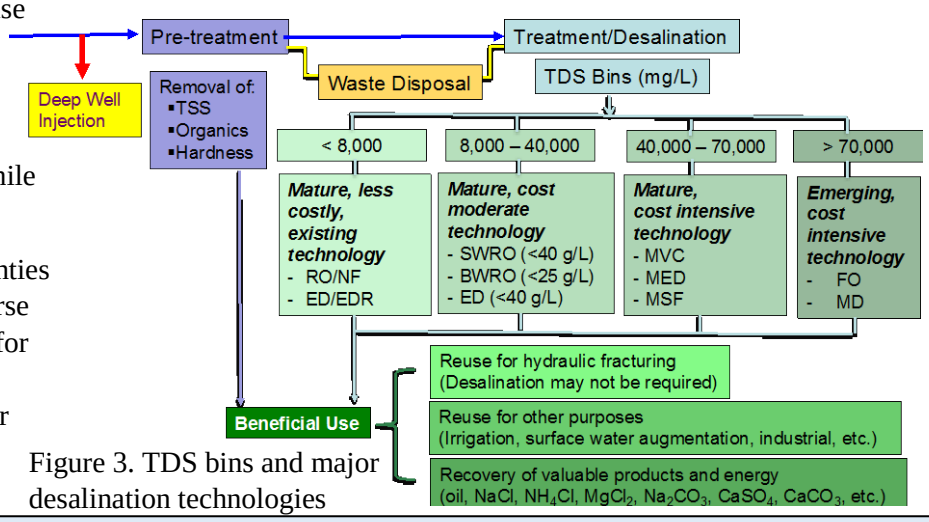

Figure 3. TDS bins and major desalination technologies

For more information, visit: https://nmwrri.nmsu.edu/produced-water/