NEXUS Practice Brief
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The hydraulic fracturing industry uses significant pulses of fresh groundwater in South Central Texas. Use has expanded in the last decade with some areas showing falling groundwater levels. Increases in water demand by cities, and industry along with *the high cost of transporting distant freshwater raises issues of depletion, water access, water cost, and inter-sectoral competition. We estimate the cost of sourcing fresh groundwater and compare it to the cost of recycling water produced during drilling in municipal facilities.*

Key Definitions

- Hydraulic fracturing or "fracking": the act of extracting oil and/or natural gas by forcing a liquid at high pressure against a target rock formation until it cracks or fractures
- Freshwater: either surface or ground water that is not saline
- Produced water: water that flows from fracking wells along with oil or natural gas during production
- Reclaimed water: produced water that has been treated and made available for reuse.

Key Messages

- As hydraulic fracturing water demand rises this will likely involve transport of more distant water, generally groundwater. As distances increase, so does the cost of water transport. This makes on-site recycling of produced water more cost competitive.
- Treatment of produced water is hindered by the high capital cost of facilities needed for the treatment.
- The costs of pumped freshwater, treated produced water and municipal treated water per acre foot (AF) are about $4,300, $5,000 and $3,900 respectively.
- The breakeven miles or distance when the cost of transported freshwater equals the cost of treating produced water ranges from 36-618 miles round trip depending on trucking prices and proximity to treatment facilities.
- Produced water can be treated under agreements with municipalities at possible lower cost. Hydraulic fracturing interests could then purchase the treated, reclaimed, water for fracking use.
- Transportation cost per AF of freshwater, including transportation from source, between treatment and use and after use for disposal, ranges from $27,930 to $85,342, depending on hauling distance.

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Details are in: Aurora Vargas. 2020. "Three Essays on Freshwater Supply, Fracking Use and Agricultural Technological Progress." PhD dissertation, Texas A&M, 2020.

See: https://wefnexus.tamu.edu/infews-ds-wsnd/

Water costs differ by source (Table 1). Commonly it is sourced from groundwater, from treating produced water in private facilities, or from treating water in existing or upgraded municipal treatment facilities.

Table 1: Cost of Water by Source Alternative

	Cost ($/AF)	*Source*
Fresh Groundwater	*$4,267*	*Sharr (2014)*
Treated Produced Water	*$5,043*	*Haines (2018)*
Reclaimed Municipal Buy-back Water	*$3,879*	*Reclaimed (2014)*

Municipal Treatment Partnerships

If there are fracking interests in an area without the capital or production volumes that permit on-site water recycling facilities, then partnerships with municipal treatment providers may be cost effective. Recently, companies in Odessa and Medina counties have agreed to cooperate with municipalities to invest in upgrading wastewater facilities so the municipalities could treat produced water. Fracking interests then purchase the treated water for subsequent fracking use (*Reclaimed Water Supply Agreement between the City of Odessa, Texas and Pioneer Natural Resources USA, Inc.*) (Table 1).

Such an agreement could mutually benefit fracking companies and municipalities as:

1. Hydraulic fracturing practitioners might acquire needed water at lower cost than freshwater
2. Municipalities would get updated wastewater treatment infrastructure
3. Competition for regional water supplies would be decreased
4. Municipalities would receive increased revenue
5. Hydraulic fracturing practitioners might reduce produced water disposal costs and prolong life of deep-well disposal sites

Breakeven hauling

We did an analysis of the breakeven hauling distance when equalizing cost between hauling in new freshwater from wells and treating produced water. The breakeven miles are determined by computing the hauling distance for freshwater (which is assumed sourced at an average cost of $4,267 per AF at the freshwater well head) plus the cost of hauling it to the fracking site. We compute the distance such that total cost just equals the cost of treated produced water delivered to the fracking site (Table 2). The mileage estimates given in Table 2 describe three trucking cost scenarios. The breakeven miles range from 36 to 616 miles. When freshwater is located at a distance farther than those computed, it is more cost efficient to treat produced water and reuse it.

Table 2: ***Cost of freshwater transportation for the Eagle Ford Shale***

Scenarios	*Cost of hauling ($/AF)*	*Roundtrip Mileage*	*Breakeven Cost of hauling ($/AF)*	*Breakeven Roundtrip Mileage*
Low	*$27,930/AF*	*317.21*	*$3,103.35*	36.36
Median	*$56,636/AF*	*643.23*	*$26,766.37*	313.64
High	*$85,342/AF*	*969.25*	*$50,429.39*	618.18

*cost of transporting an AF of water for one mile $88.05

Haines, L. 2018. “Shaving Water Costs. Water Solutions.” *Oil and Gas Investor*. May, pp. 69-72.

Reclaimed Water Supply Agreement between the City of Odessa (2014), Texas and Pioneer Natural Resources USA, Inc.

Sharr, A. Water Management Trends & The Eagle Ford. Baker Hughes (November 2014): http://www.tamuk.edu/eagleford/pdf/Baker_Hughes_April%20Sharr.pdf (accessed August 15, 2019.