Splish Splash –– Water Challenges Permian Growth

Producers and Water Midstreamers Scramble to Address Water Supply and Produced Water Takeaway Needs

- **Permian Basin producers face daunting water-related challenges: securing the large and increasing volumes of water they need for hydraulic fracturing and dealing with increasing amounts of "produced water" from unconventional/horizontal wells.**
- **Produced water is nothing new –– in the Permian or other regions –– for decades, conventional/vertical wells in the play have generated 10 or more barrels of produced water for every barrel of crude, but that water can be re-injected into pressure-depleted oil reservoirs to stimulate further production.**
- **Unconventional/horizontal wells in the Permian typically generate much less produced water per barrel of oil –– generally one to four barrels per barrel of crude –– but there's no room in the shale/tight sands for re-injection.**
- **Dealing with this produced water often involves trucking long distances to saltwater disposal wells, but producers and midstream companies now are scrambling to develop pipeline networks to reduce transportation costs.**
- **Increasing volumes of produced water are being treated for re-use in hydraulic fracturing.**

1. Introduction

Production growth in the Permian Basin continues to have profound effects on the crude oil, natural gas and NGL markets. It also has helped to spur the rapid development of what is, in effect, another midstream sector: one that focuses on the delivery of large volumes of water for hydraulic fracturing and –– just as important, and even more challenging –– the gathering and transportation of vast and increasing amounts of "produced water" that emerge from Permian wells with crude and associated gas.

The trends toward longer horizontal wells and more intense well completions have resulted in the need for sharply higher volumes of water (and frac sand) during the hydraulic fracturing of Permian wells. Our understanding is that the amount of water needed to complete a typical well in the region has increased from less than 100 Mbbl in 2014 to more than 300 Mbbl in 2017, and that water use per well can run considerably higher. A recent analysis by one Permian water supplier (Layne Water Midstream) found that in Reeves County, TX (in the southern part of the Permian's Delaware Basin), the water needed for a well completion averaged 390 Mbbl last year, up from 215 Mbbl in 2015. Industry reports indicate that some huge Permian frac jobs have used up to 1 MMbbl of water per well.

Supplying large volumes of water for Permian well completions is not an easy task in dry and dusty West Texas and southeastern New Mexico. Traditionally, the task of delivering that water has gone to fleets of trucks. But with the volume of water needed for well completions rising quickly, producers and water midstream companies have been developing water pipeline systems that can bring large volumes of water to the lease at a much lower cost per barrel.

The Permian's water-related challenges do not end with the water needed for well completions – – far from it. Each barrel of crude oil that emerges from a Permian well can generate many times more produced water that needs to be gathered and safely disposed of. That task is relatively simple for the 10, 12 or more barrels of produced water that come of out of conventional, vertical wells with each barrel of crude; most of that produced water can be re-injected into pressure-depleted conventional oil reservoirs for enhanced oil recovery (EOR). The re-injected water boosts pressure within the reservoirs and stimulates the production of still more crude.

But there is a problem — and a big one. The Permian's rapidly increasing number of unconventional, horizontal wells generate produced water too. Not as much per barrel of crude as conventional, vertical wells — generally between one and four barrels per barrel of crude (sometime more), and more than three barrels on average. But while most of the produced water from conventional wells can be re-injected into pressure-depleted oil reservoirs nearby for EOR, the produced water from unconventional, horizontal wells cannot be. Instead, the produced water from these leases needs to be transported — often long distances — to saltwater disposal wells (SWDs). SWDs are drilled specifically to receive large volumes of produced water and inject it deep into non-oil-producing geologic layers so that it does not foul the oil-producing layers or layers that produce potable water.

Given that there was no existing pipeline infrastructure in place to help transport these large volumes of produced water from unconventional wells to SWDs, the common practice has been to rely heavily on trucks. That can be very costly, though, because of the number of trucks required and the long distances they often must travel from the lease to the SWD — then back again for another load. Now, with a number of large Permian producers implementing long-term plans for the systematic, assembly-line development of their vast holdings, it makes sense to build out pipeline systems to deliver water to the lease for use in hydraulic fracturing as well as pipeline systems to gather produced water and transport it to networks of SWDs. Generally speaking, moving water or produced water by pipeline can reduce transportation costs by half or more — a critically important factor as producers struggle to rein in their total production costs.

Even more critical than cost, though, is the need for system reliability. Producers and their contractors cannot complete unconventional wells without water, and wells cannot begin producing without a clear, fail-safe plan for dealing with all of the produced water that will be emerging from the lease with crude oil and associated gas. Some of the water and produced water pipeline systems now in place in the Permian were developed by producers themselves, while others were built out by water midstream companies — many of them backed by private equity — that see the provision of water-related services as a promising and profitable business as Permian production continues to ramp up.

The water/produced water part of the Permian story continues to evolve. For example, while the vast majority of produced water from unconventional wells is being injected in SWDs, a small but growing percentage is being treated and re-used in well completions. Also, there is concern that some parts of the Permian may be susceptible to "induced seismicity" — earthquakes tied to produced-water injection — and that, as a result, it may become increasingly difficult in some areas to secure the permits needed to drill new SWDs. If it does, the costs associated with transporting some produced water longer distances would raise producers' costs.

In this Drill Down Report, we will review our analysis of past and present produced water volumes being generated in the Permian by conventional and unconventional wells, and discuss a number of representative water and produced water pipeline systems in the Permian — some existing and some planned. We will also consider the play's need for more water-related infrastructure as production there continues to grow.

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