# Texas Produced Water Management

Texas Desal 2018

September 13-114, 2018

Austin, Texas

Presented by: Steve Coffee, President Produced Water Society

# Introduction

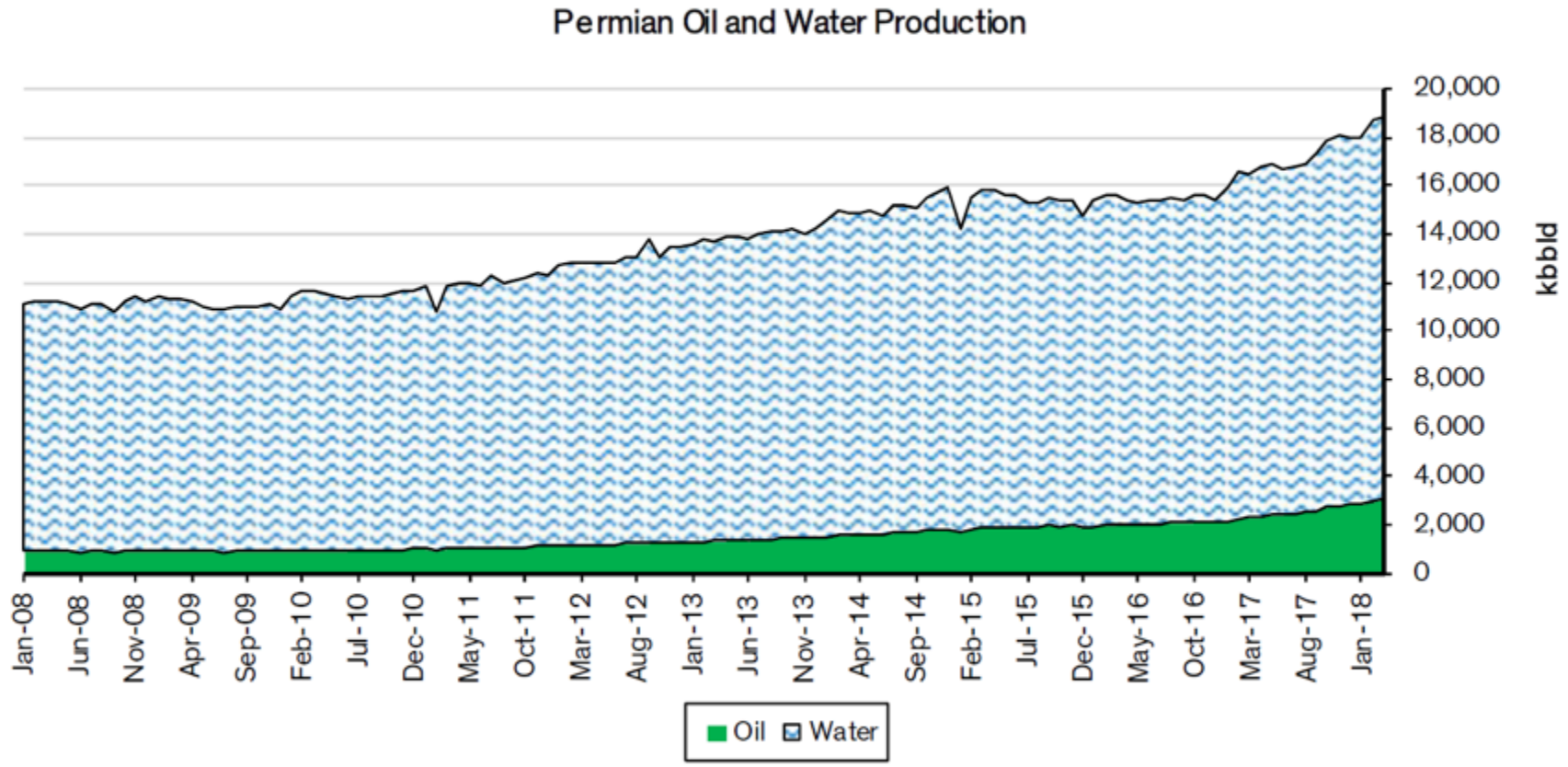
- Different types of oil and gas production have different water needs and generate different amounts and types of wastewater
- Oil and gas companies must manage the water in a way that meets regulations and has an affordable cost
- There are different water management options that are chosen in different locations.  The oil and gas companies may choose different options and strategies over time as the factors affecting their decisions change
- Produced Water should be thought of as an asset, not a waste

# Introduction

- Opportunities for outsourcing water management operations in the upstream oil and gas industry continue to arise, driven by production volumes and costs.
- At present the global produced water to oil ratio is at 5:1 barrels.  With the range of 3:1 to 22:1 (1:1 to 8:1 for unconventional).
- 210 billion bbl/yr now and forecasted by some to go to 340 billion bbl/yr by 2020.
- Permian Produced Water volumes reach 18 MM bbld
- If the Permian was a national, it would be the 8$^{th}$ largest producer in the world

# Permian Production & Produced Water

EXHIBIT 1: **Permian oil production has grown rapidly, to about 3 mmbbld, but water has grown just as fast – to about 16 mmbbld**




Source: DI Desktop, Bernstein analysis

# Introduction

- Over the past decade, the concept of produced water reuse for activities other than secondary recovery has been discussed and promoted.  But beneficial use remains a challenge for various reasons.
- Only a small percentage of the total produced water is put to a beneficial use other than secondary recovery in the conventional market.
- There are several market drivers and restraints. Drivers include: oil price; water-to-ratio; environmental regulations; water scarcity; and, the industry's conservative approach.

# One Example

| Management Practice | # Wells Using That Practice | Total Volume of Produced Water Managed by That Practice (bbl/year) | Percentage of Produced Water Managed by That Practice |
|---|---|---|---|
| Injection for enhanced recovery | 401 | 31,336,098 | 3.4% |
| Injection for disposal | 3,231 | 857,417,339 | 92.4% |
| Surface discharge | 0 | 0 | 0 |
| Evaporation | 0 | 0 | 0 |
| Offsite commercial disposal | 44 | 38,880,938 | 4.2% |
| Beneficial reuse | 4 (reuse of flowback) | 280 | 0 |
| Total Volume Managed | | 927,634,375 | |

# Spending

| Operating expenditure by segment ($m) | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|
| Labour (in-house services) | 149,007.1 | 152,367.7 | 156,116.0 | 160,396.8 | 164,733.6 | 168,903.4 | 174,231.8 | 178,952.9 |
| Energy | 48,061.1 | 49,392.8 | 50,921.2 | 52,864.1 | 54,800.3 | 56,722.8 | 58,999.9 | 61,252.8 |
| Parts & consumables | 22,629.4 | 23,189.3 | 23,784.2 | 24,446.0 | 25,113.6 | 25,733.4 | 26,551.8 | 27,256.1 |
| Chemicals | 21,642.9 | 22,187.4 | 22,746.8 | 23,350.3 | 23,962.7 | 24,553.5 | 25,249.5 | 25,908.0 |
| Third party services | 58,962.6 | 60,433.9 | 61,867.5 | 63,483.9 | 65,339.6 | 67,183.0 | 69,494.3 | 71,524.6 |
| Oil & gas water services | 32,238.8 | 34,504.4 | 30,633.9 | 28,736.5 | 27,121.6 | 27,508.4 | 29,422.5 | 32,005.0 |
| Other | 97,436.2 | 99,560.1 | 102,058.1 | 105,039.1 | 108,027.0 | 110,936.1 | 114,868.1 | 118,283.2 |
| **Total operating expenditure** | **429,978.1** | **441,635.6** | **448,127.6** | **458,316.6** | **469,098.4** | **481,540.5** | **498,817.9** | **515,182.6** |

# Why is PW not Reused More?

- **Barriers and Solutions to Overcome Them - Economics**
- **Water is heavy and expensive to move long distances**
- **Injection into disposal wells has been convenient, inexpensive, and accepted by regulators -Little incentive to look at other water management options in many regions**
- **Solutions -Continue to development of cost-effective desalination approaches that can work dependably in harsh oil field environments**
- **Induced seismicity in a few regions has reflected negatively on disposal wells and created a new opportunity for beneficial use of produced water**

# Why is PW not Reused More?

- **Barriers and Solutions to Overcome Them - Policy**
- **Water rights. As long as produced water is a waste, water rights owner is not too concerned. But if produced water can be sold, water rights owner wants a cut of the fee.**
- **Liability. Large oil and gas companies are worried about the risk of later lawsuits if produced water is sold or given to end users**
- **Solutions –Try to educate lawmakers and staffers**
- **Look to establish third-party entities that can accept produced water and distribute it to end user (mitigates liability)**
- **Look to states that have developed innovative regulatory programs to allow and encourage beneficial use**

# Solutions

- Encourage more & better data collection
- Look to applications for better data visualization
- Initiate research efforts to collect more data on produced water quality
- Regulations may need to be revised to allow these interactions
- Develop and publish case examples to help educate user and potential users

# Other thoughts…

- **Sometime there is limited surface and groundwater resources available**
- **Traditional solution has been disposal in injection wells**
- **Tremendous opportunities to reuse & recycle produced water**
- **Water supply, transfer, and disposal can average 20% of well completion costs**
- **Water to oil ratios are typically above 1:1 so produced water disposal cost can be >25% of lifting costs**
- **During exploration and early development, minimal infrastructure is in place to support water supply and disposal**
- **Solutions must be safe, environmentally responsible, sustainable, and economic**
- **Water needs to be delivered in a timely manner**
- **Minimize trucking/hauling of water whenever appropriate**
- **Reuse produced water for stimulation whenever appropriate**
- **Reuse or dispose of all produced water so that production targets can be achieved**

# Other thoughts…

- **Optimize capital investment for short and long term cost reduction**
- **Install infrastructure that enables flexibility and choice for short and long term**
- **Central gathering and distribution locations**
- **Utilize technology and temporary solutions**
- **The produced water must not pose a safety risk**
- **The water treatment process needs to be cost effective and fit for purpose**
- **The produced water should perform comparably to the fresh water that was used before in frac**
- **The produced water should not cause any long term production issues or “life of the well” problems**

# Acknowledgements


- **Global Water Intelligence**
- **ConocoPhillips**
- **Argonne National Laboratory**
- **Department of Energy**
- **Energy Information Administration**
- **Exterran**
- **Solaris Midstream**
- **Veil Environmental, LLC**