



# Devon Energy's Delaware Basin Water Management Program

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Produced Water Workshop

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NYSE: DVN  
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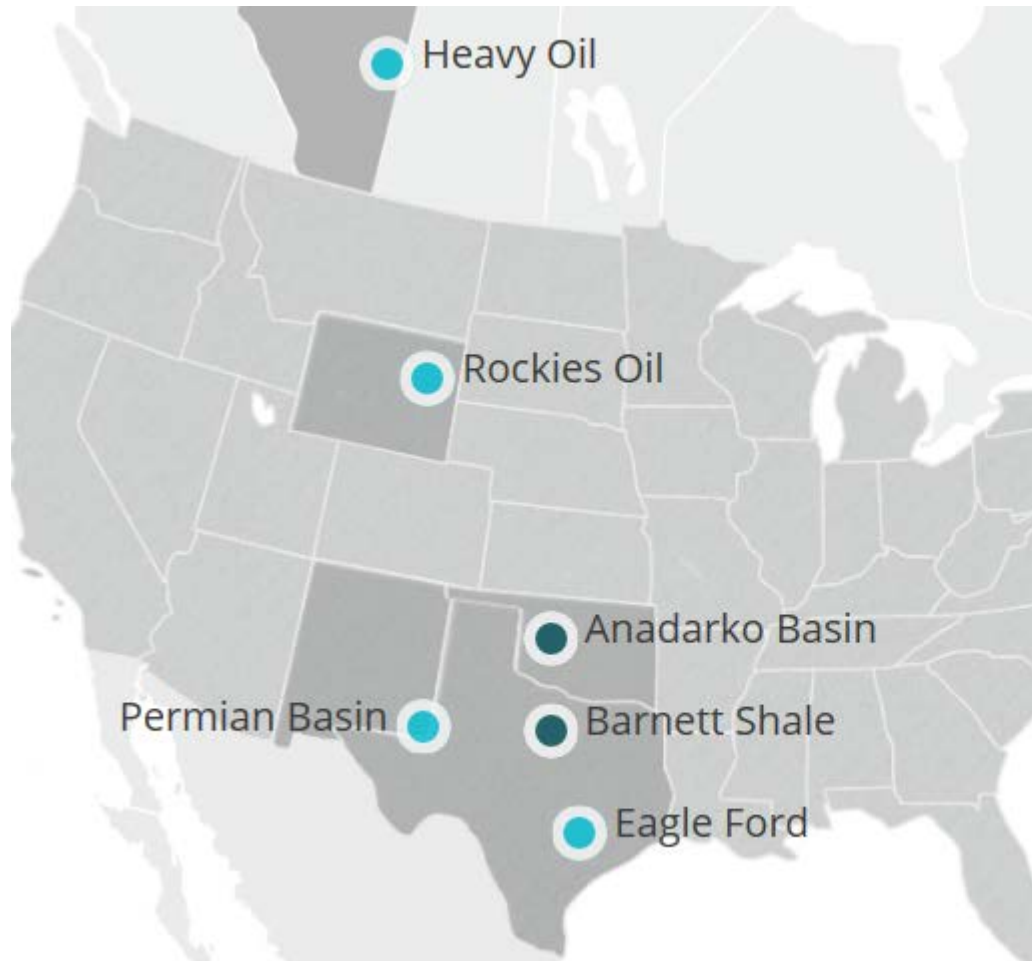
# Agenda

- Introduction – Devon Overview
- Past Water Management Case Studies
- 2015 Water Management Case Study
  - Strategic Drivers
  - Regulatory Considerations
  - Water Infrastructure
  - Water Treatment
  - Timeline
- Continued progress
- Preparation for the future



# Introduction

## 2015 Devon Overview



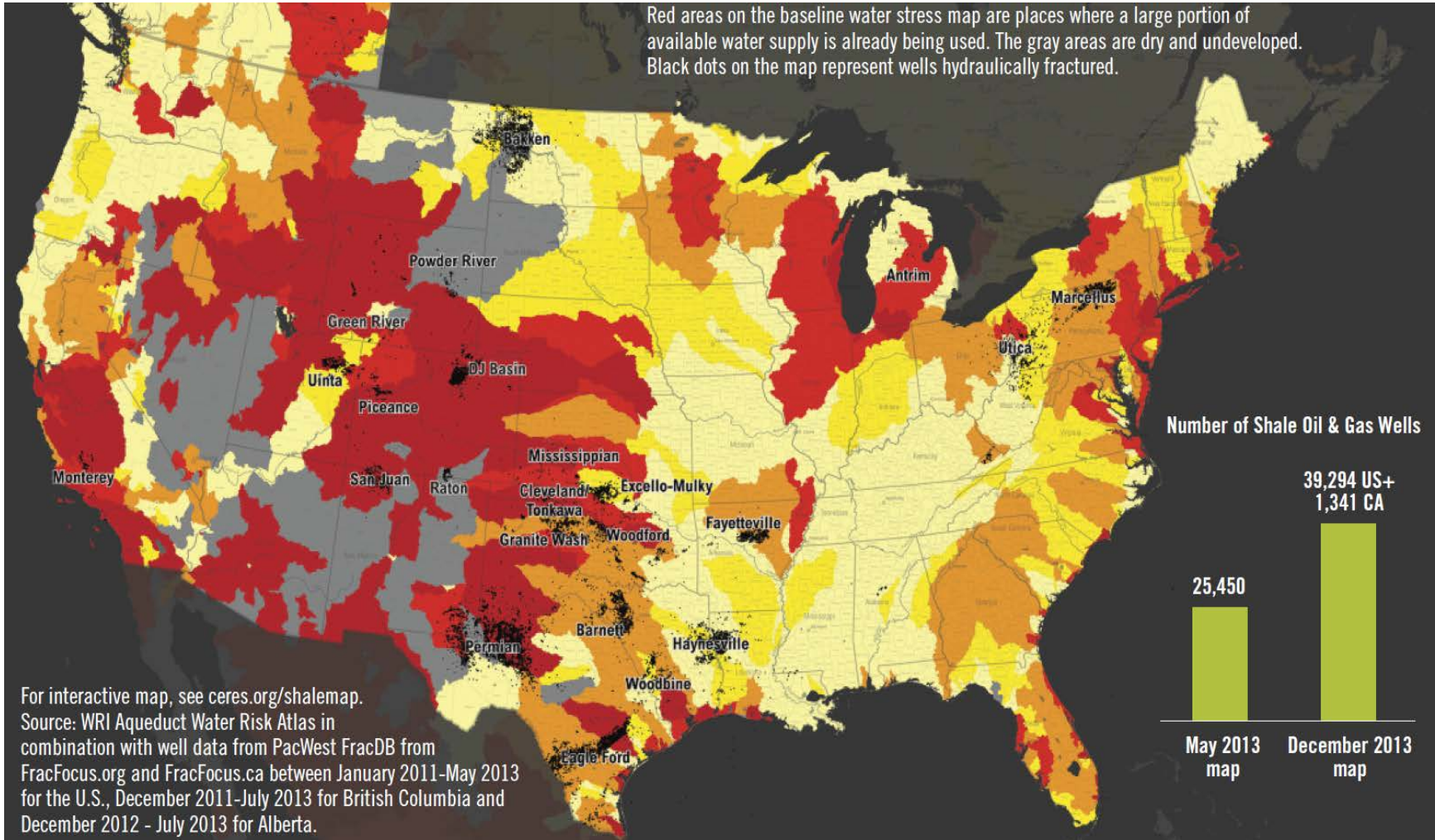
### Total Company Key Stats

Net acres:	6,200,000
Gross producing wells:	≈ 29,900
Production (Q3 net):	680 MBOED 61% liquids
Reserves (12/31/14):	2.8 BBOE 53% liquids
2015e E&P CapEx:	≈ \$3.8 - 4.0 billion
2015e Drilling plans:	≈ 720 gross wells
Operated rigs (9/30/15):	18



# Water Stress Map

Red areas on the baseline water stress map are places where a large portion of available water supply is already being used. The gray areas are dry and undeveloped. Black dots on the map represent wells hydraulically fractured.

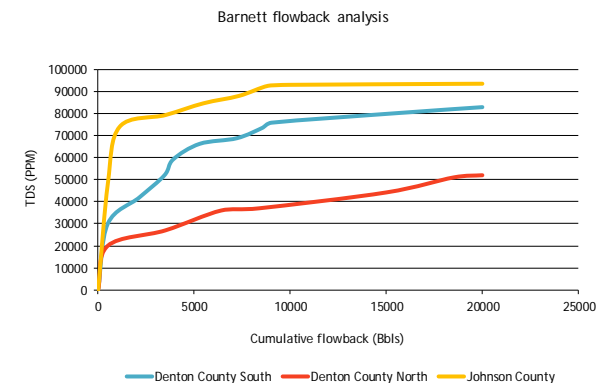


Hydraulic Fracturing & Water Stress: Water Demand by the Numbers – Shareholder, Lender, and Operator Guide to Water Sourcing. Ceres 2014.

# Case Study 1 – North Texas



- Drivers – Disposal capacity, water scarcity
- Chemical pretreatment – clean brine
  - Remove solids, iron, oil, polymer
  - 10,000 bpd capacity per unit
- Distillation
  - Vaporizes water and condenses it - clean, distilled water
  - Remaining concentrate removed for disposal or utilized for as “kill fluid”
  - 2,500 bpd capacity per unit
- Regulatory engagement - RRC
- Multiple sites over nearly a decade of activity through 2013



# Case Study 2 - Anadarko



- Drivers – drought, truck traffic
- High quality produced water
- Settling, Disinfection
- Centralized facility
  - Saltwater Disposal Well
  - 500,000 bbl storage pond
- Automated monitoring
- Pipeline network
  - 8"-12" fiberglass
  - Approximately 35 miles
- Regulatory engagement
- Maintained operations during dry periods
  - 2012-2014





# Case Study 3 – Midland PBTX East



- Drivers - Water scarcity, disposal capacity
- Brackish groundwater wells
- ClO<sub>2</sub> treatment of produced water
- Covered brackish frac ponds
- 42,000 bbl ASTs for recycle
- Layflat hose for transfer
- Some permanent collection added
- Automated monitoring
- Data management pilot
- Near zero fresh water demand 2013-2014



# 2015 Case Study – Drivers

## *Delaware Basin New Mexico*

- High Cost and Risk
- High Water Demand
- Freshwater Scarcity
  - No Surface Water Available
  - High Competition for Groundwater
- High Cost of Trucking and Disposal





# Recycling Regulations

## *Delaware Basin New Mexico*

- NMOCD Rule 34
  - Developed to encourage the recycling and reuse of produced water, drilling fluids, and other liquid oil field waste.
  - Authorizes the storage of produced water in double lined earthen impoundments.
  - Permit by Rule
  - Before Rule 34, large ASTs required lengthy permitting process to store produced water.

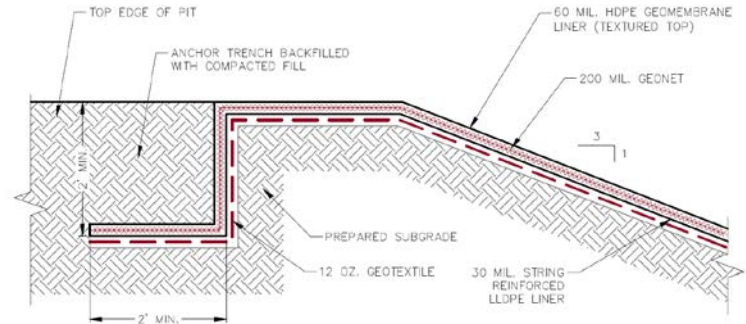


# Environmental Protection

## Delaware Basin New Mexico



- Pre-Construction Environmental Site Assessments
- Double-lined Impoundments
- Real-Time Leak Detection Between Liners
- Hydro Test all Primary Liners Before Initial Use
- Bird Deterrents



\* Liner System Detail



Freshwater Hydro Testing New Impoundment



\* Bird Diverter Device



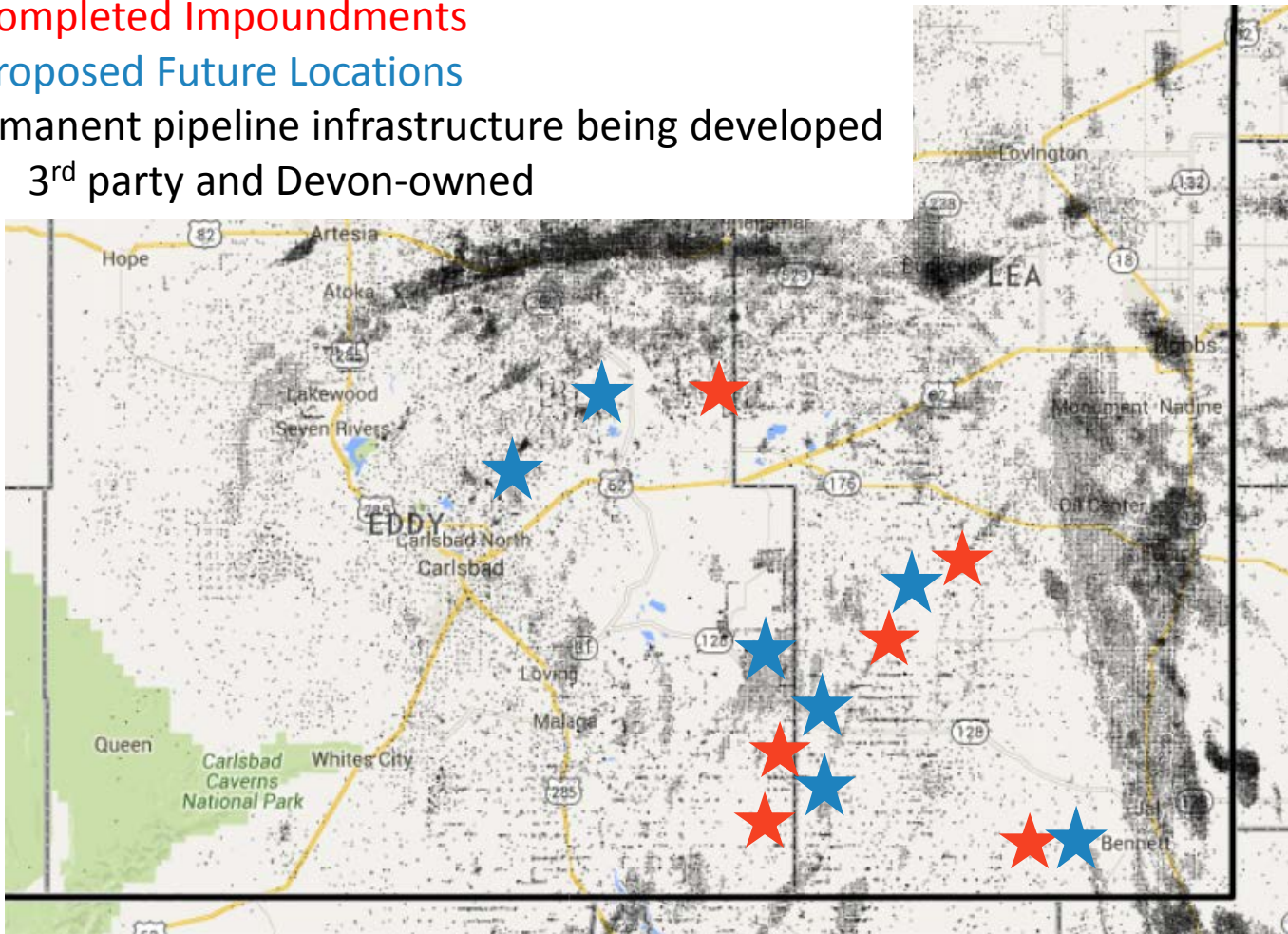
Leak Detection System with Real Time Notification



# 2015 - Infrastructure

## *Delaware Basin New Mexico*

- 6 Completed Impoundments
- 7 Proposed Future Locations
- Permanent pipeline infrastructure being developed
  - 3<sup>rd</sup> party and Devon-owned



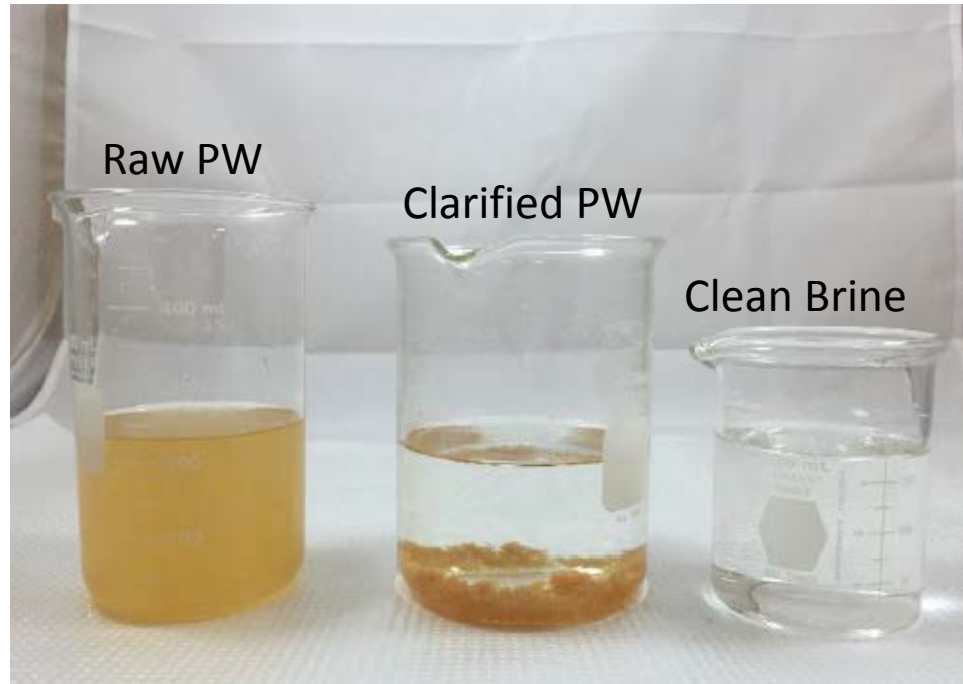


# Water Treatment

## *Clean Brine Standard*

- Removal of oil residual
- Removal of TSS
- Removal of Iron
- Bacteria Reduction
- Turbidity <10 NTU

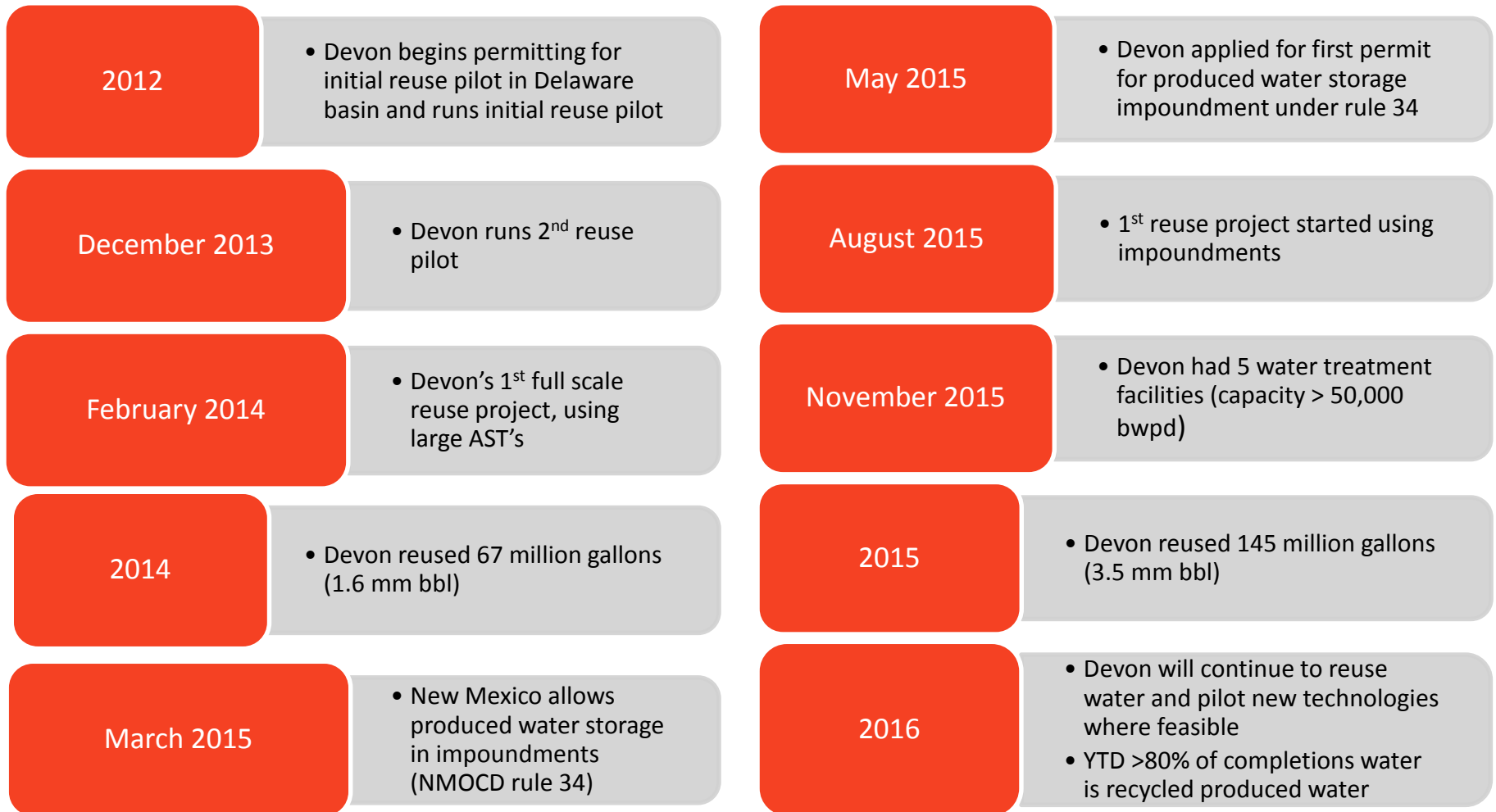
Waste Sludge



- Treatment Targets Vary Depending on Use and Storage Method
- Waste is Either Pressed into Solids for Landfill or Disposed into SWD

# 2015 Case Study - Timeline

## Delaware Basin New Mexico



# Industry Trends

INDUSTRY TRENDS		BENEFITS
Improving Fracturing Chemistry	➔	Increasing use of non-fresh water
Innovation in Treatment Technology	➔	Increasing feasibility of produced water reuse
Increasing Water Conveyance Systems	➔	Reducing truck traffic
New Water Storage Designs	➔	Provides flexibility and reliability when using non-fresh water
Increasing Transparency	➔	Improves relationships with stakeholders
Dedicated Water Staff	➔	Improves water management, planning technical support and performance



# Devon Water Management Team

*Preparing for the future*

- Dedicated Staff – Operations Excellence Water Team
- Tactical and strategic goals
- Focus areas to reduce cost and risk
  - Stakeholder Engagement
  - Standards
  - Technology
  - Planning



Thank you



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