



Produced Water Treatment and Reuse in New Mexico

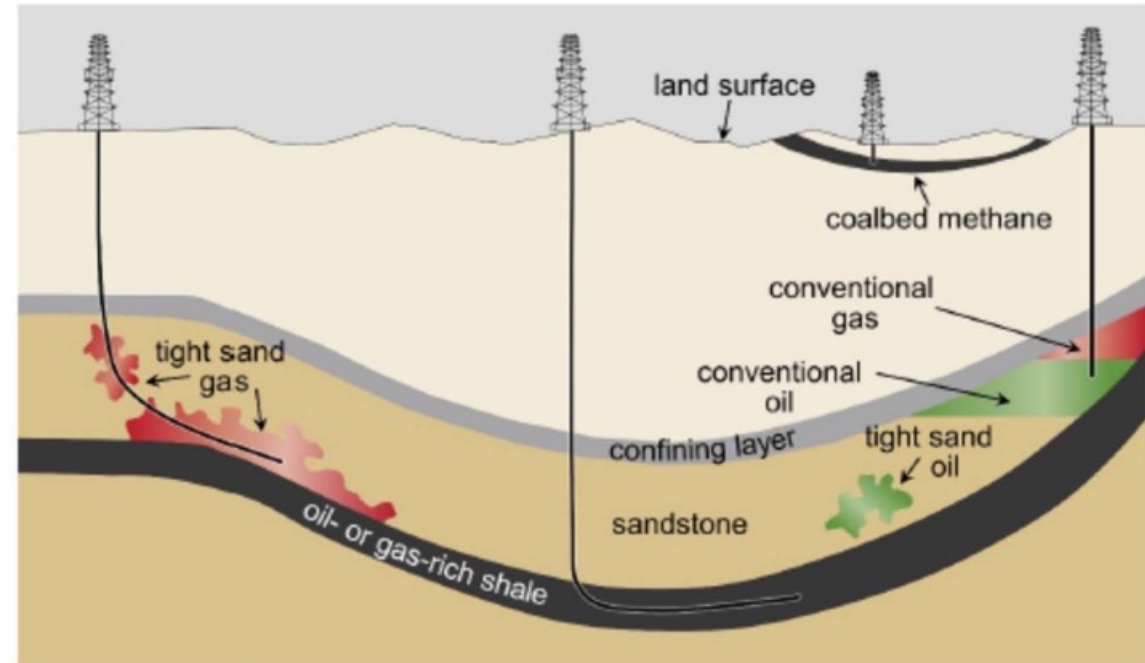
AWWA WATER SEMINAR
MARCH 15, 2023

Mike Hightower, Director
New Mexico Produced Water Research Consortium



What is Produced Water

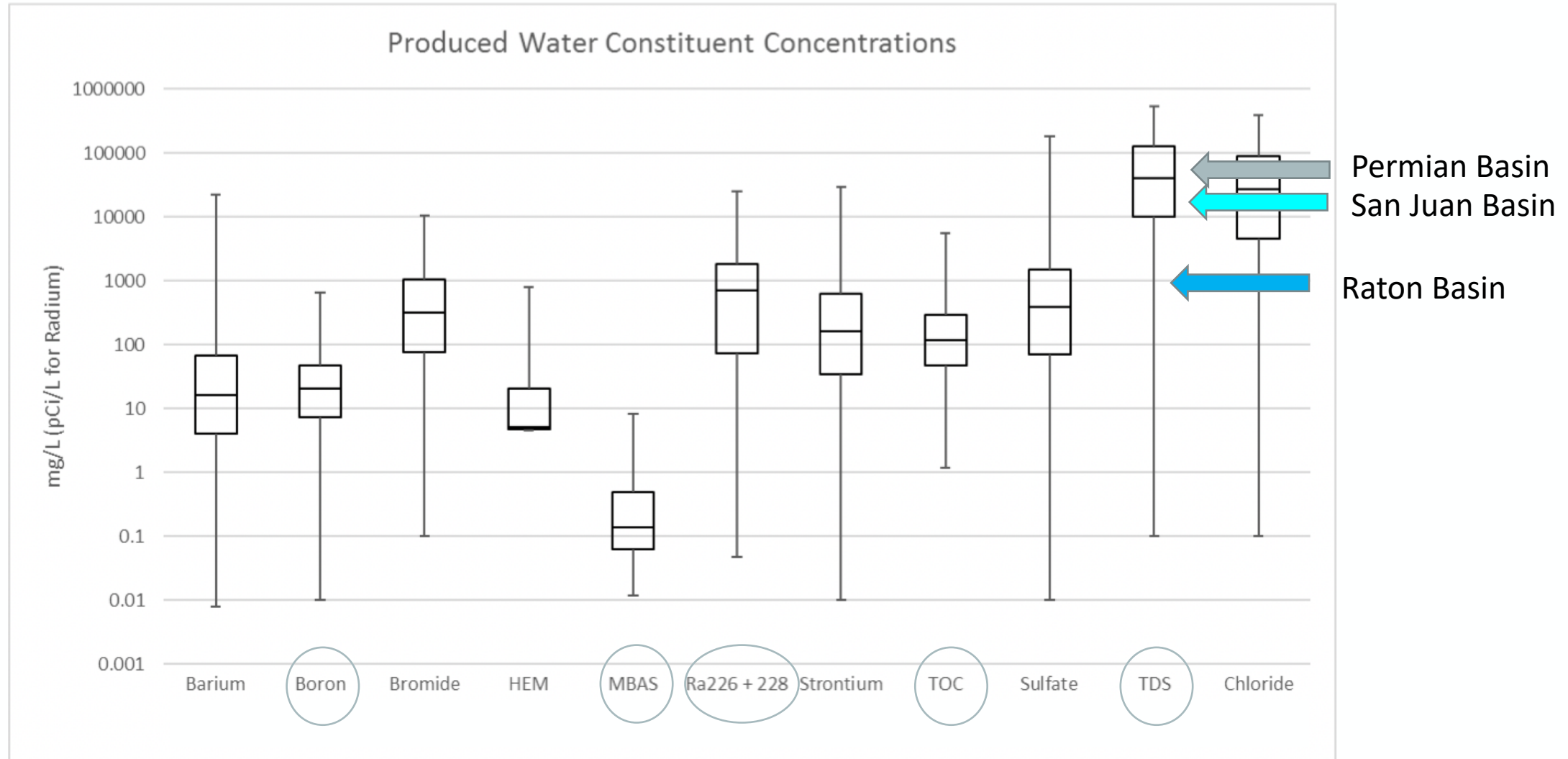
- Produced water is defined as:
 - “the water brought up from the hydrocarbon-bearing strata during the extraction of oil and gas, and can include formation water, injection water, and any chemicals added downhole or during oil/water separation process”
- Often contains high levels of minerals and organic compounds, plus drilling and completion chemicals
- Quality varies by location, formation, and type of well



Oil and Gas Production

Oil and gas production is from ancient seas, shallow plays, or coal plays

Produced Water Variability and Treatment Challenges



[EPA-821-S19-001]

Comparison of Different Waters for Reuse



Raw Municipal Waste Water

~60 major constituents
(many tentatively identified compounds)



Raw Pecos River Water

~70 major constituents
(many tentatively identified compounds)



Raw NM Produced Water

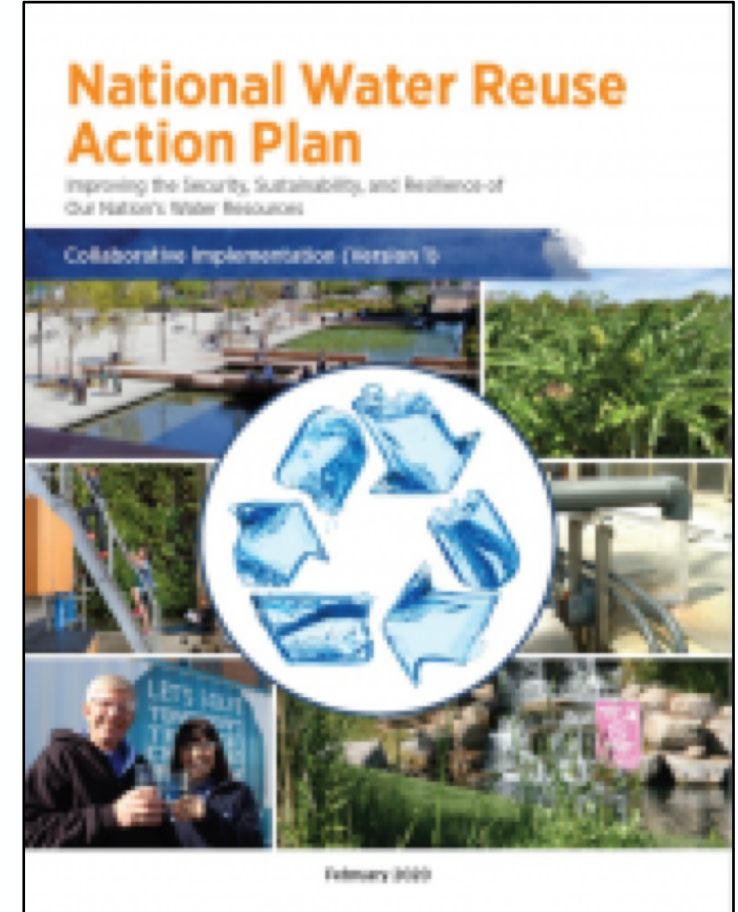
~90 major constituents
(several tentatively identified compounds)

Based on NPDES-based evaluation of 300 major chemical compounds

EPA and Industry Driving Produced Water Treatment

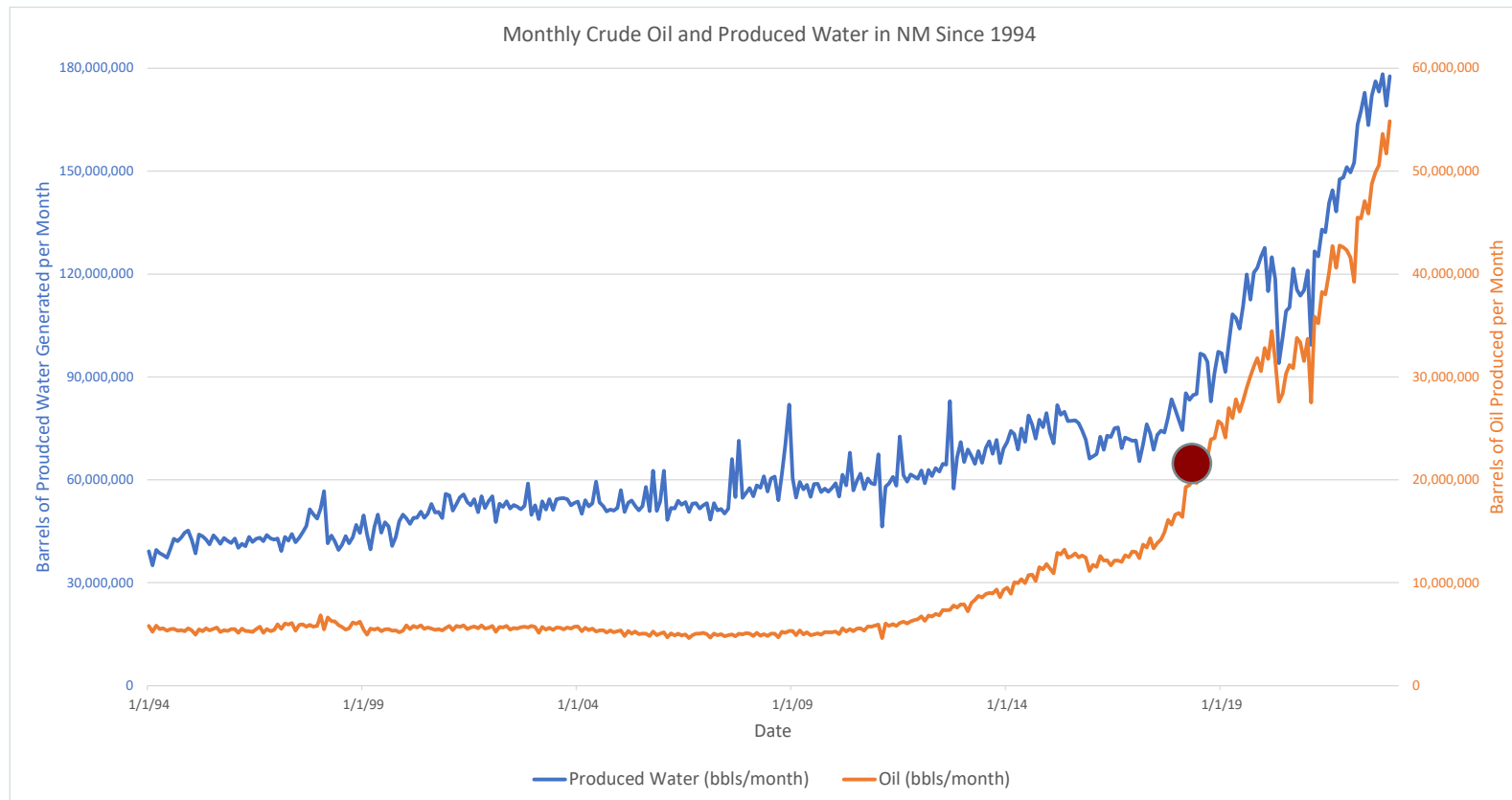


- Focus on the fit-for-purpose treatment and reuse of waste water
- Five major EPA programmatic areas:
 - Thermo-electric cooling water
 - Agricultural waste water
 - Municipal waste water
 - Produced water
 - Storm water



Produced Water as a Future Water Source in NM

- At 2018 production rates OCD estimated New Mexico had 10 years of produced water disposal capacity

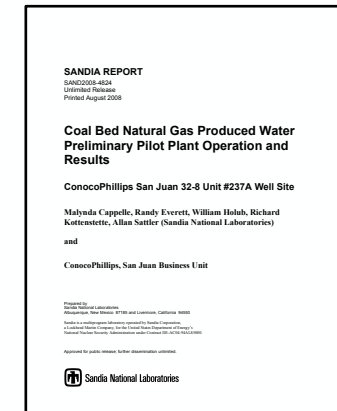
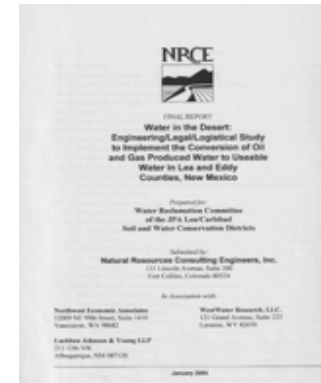


2022 New Mexico Water Policy
and
Infrastructure Task Force

“... augment supply regionally,
through such tools as brackish
groundwater desalination,
wastewater reuse, and treated
or recycled produced water.”

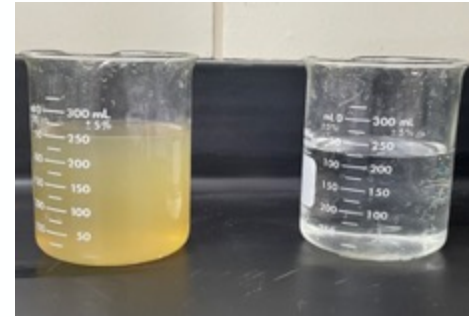
Historical Produced Water Treatment and Reuse Testing

- Conoco Phillips/Sandia/NMSU Ag Research Center 2004-2008
 - Research permit with BLM and OCD
 - Treated 25,000 ppm TDS produced water with pre-treatment and RO - then blended with produced water
 - 6 tons/ac CO2 sequestration
 - Local sprinkler systems to apply to several acres
 - 3-4 acre-inches per year to supplement rainfall
- Lea County Soil and Water CD - 2003
 - Pretreatment and treatment with RO
 - Conventional 35,000 ppm TDS produced water



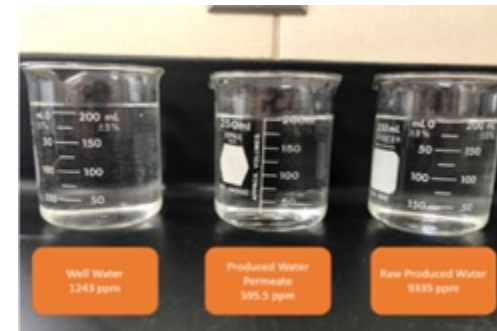
Current NM Produced Water Treatment Research

- PWS ‘Clean Brine Standard’
 - Bench and pilot-scale testing
 - No/low bulk chemical use
 - No/low voc emissions
 - Small footprint/scalable
 - <\$0.20/bbl
- Treatment
 - Testing and operations showing outstanding performance - four/five tests/operations scheduled for 2023
 - Cooperative testing with TXPWC and Colorado in 2023



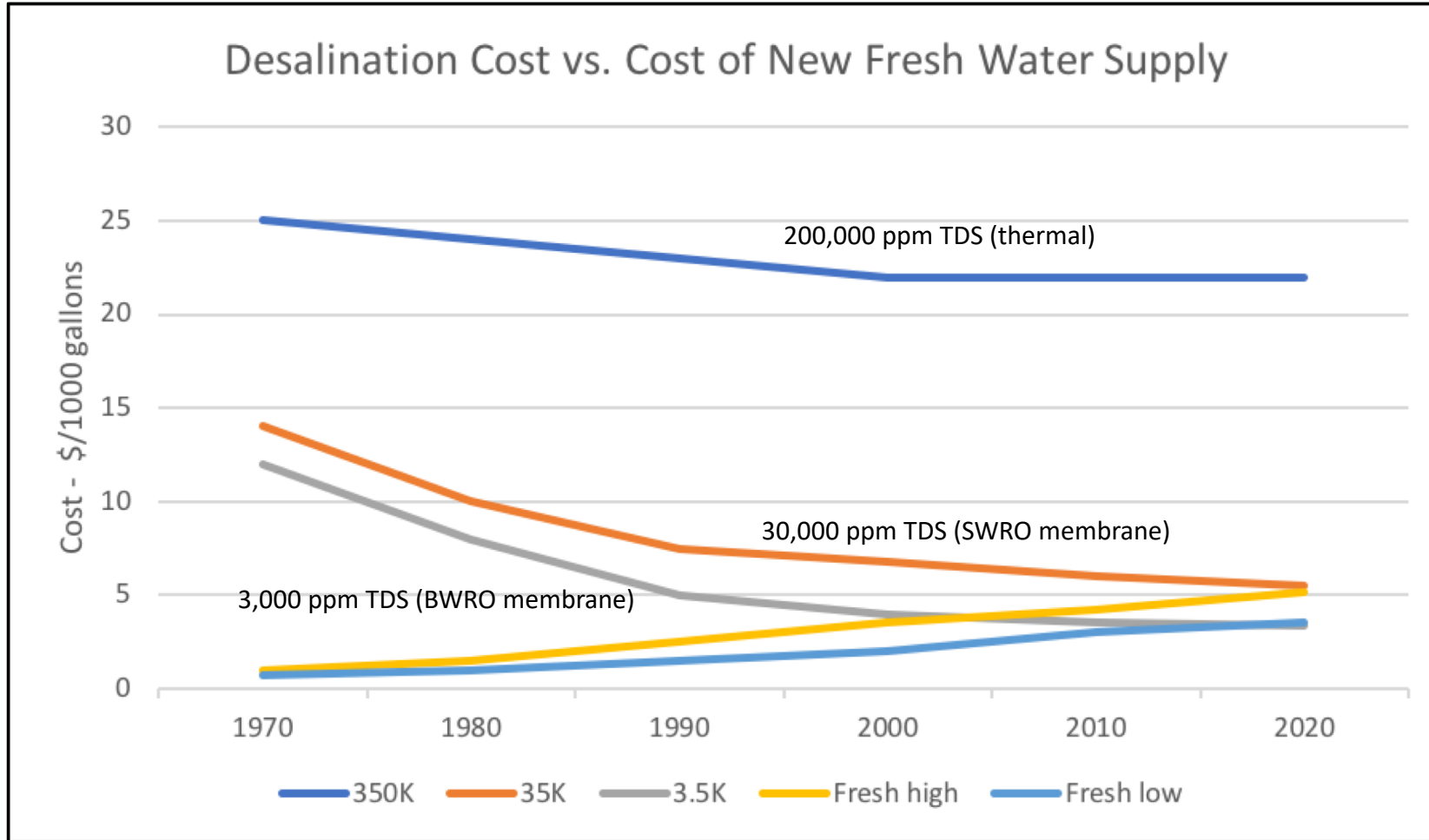
Permian Basin
100,000 TDS
Pretreatment

Permian Basin -
100,000 TDS
Pretreatment



San Juan Basin
10,000 TDS
RO Treatment

Produced Water Treatment Now Cost-effective

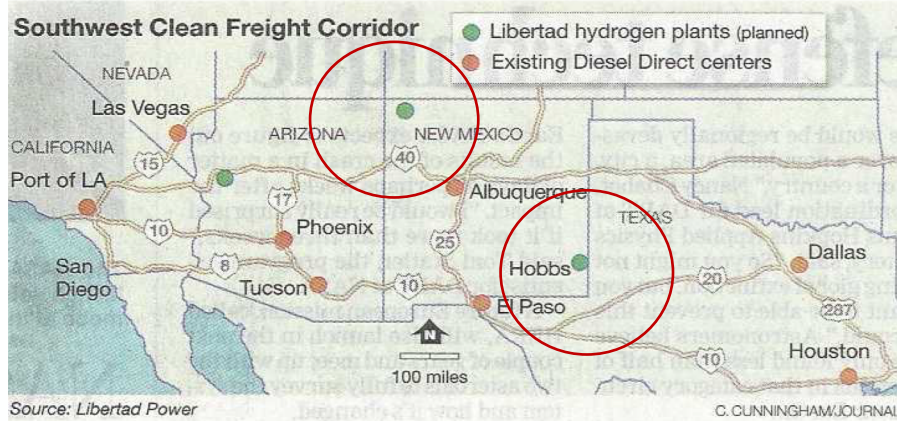


Produced water disposal in 2005 in NM was typically \$2-75/1000 gal

Produced water disposal in 2023 in NM is typically \$25-100/1000 gal

Desalination treatment is generally below 1000 mg/L TDS, but produced water often needs pre/post treatment, which has improved significantly

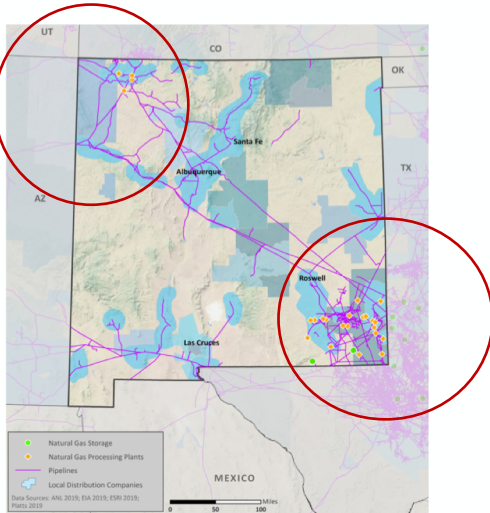
Trends in Treatment and Reuse Opportunities



The Roosevelt Project

A New Deal for Employment, Energy and Environment

2 of 3 gas pipelines to CA



Intersection of all 3 US E- Grids

Lowest levelized cost of wind and solar

SWD, EOR, pipeline, natural gas infrastructure

NMED - Non Discharge/Closed Loop

- Greenhouses
- Data Center cooling
- Industrial

OCD – Inside oil and gas

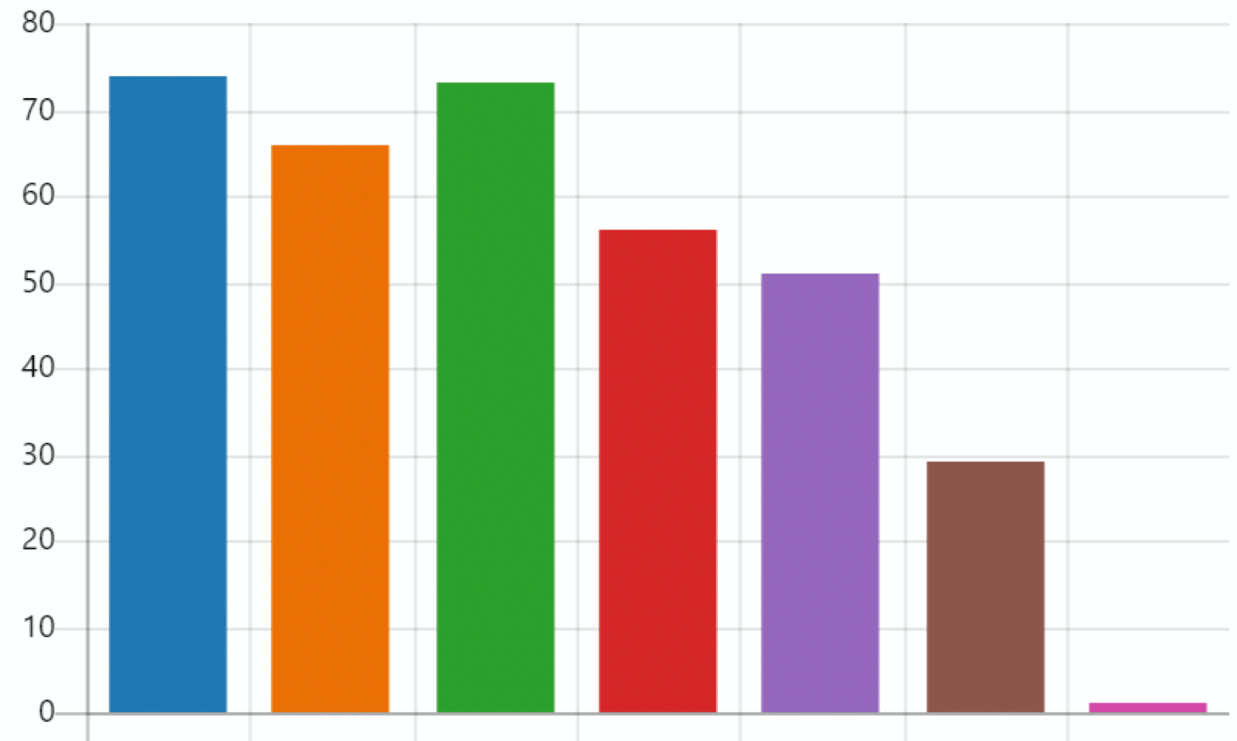
- Blue and Green Hydrogen – transportation fuel, heating, electric grid reliability
- Orphaned wells, plugging and abandonment, well pad restoration – thousands

Treated Produced Water Ownership

- In NM owned by the treater

Public Support of Fit-for-Purpose Produced Water Treatment and Reuse

- Use inside oil and gas
- Industrial use outside oil and gas
- Ag uses (non-food crops)
- Multiple ag uses (food crops)
- Supplement drinking water
- Need more info
- Do not support any use



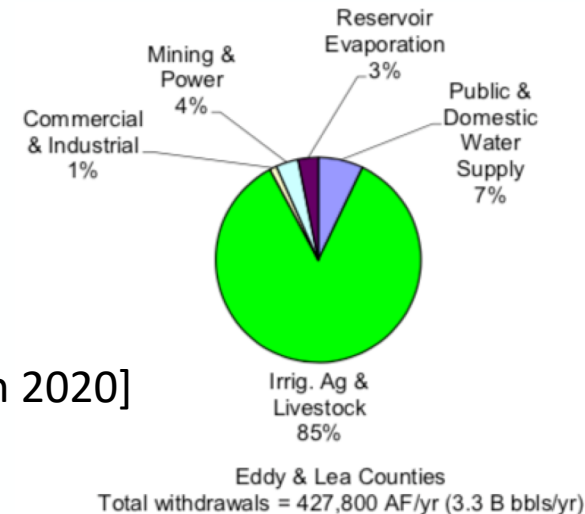
(Approved Survey of 120 respondents at Science Day - 2022 NM State Fair)

Addressing Produced Water Treatment and Reuse Issues

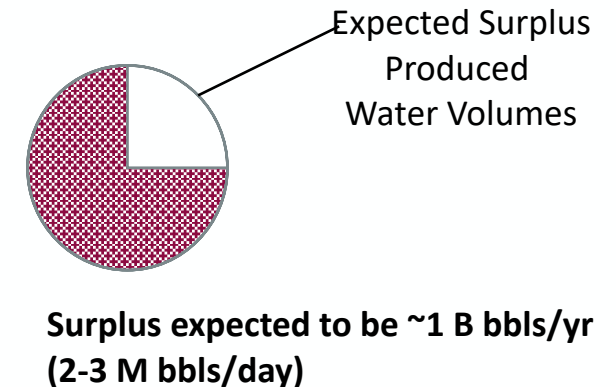
- Is treatment cost effective?
 - Consider O&G avoided costs
- How to handle the concentrate?
 - 50-60% recovery w/solids disposal
- What about the energy transition
 - Will produced water be available?
- Is there enough produced water to be of importance locally?
- Is it safe?
- Will the public accept it?
- Can we afford not to do it?



The Monte Kali potash mining salt mountain tourist attraction near Heringen, Germany.



[Thomson 2020]



NM Produced Water Research Consortium

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