

# Concentrate Enhanced Recovery Reverse Osmosis: Part 2

CONCENTRATE VOLUME REDUCTION IN EL PASO, TEXAS.

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# Introduction: CERRO System

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In 2017, EPWater commissioned H2O-Terra the design and construction of 3 CERRO Desalination systems.

The design and initial construction phase were presented at the 2018 MSSC Annual Salinity Submit.

CERRO stands for Concentrate Enhanced Recovery Reverse Osmosis.

It is a “Batch” Desalination System.

# History of CERRO

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First Prototypes were tested at the Kay Bailey Hutchinson Desalination Plant in El Paso, Texas.

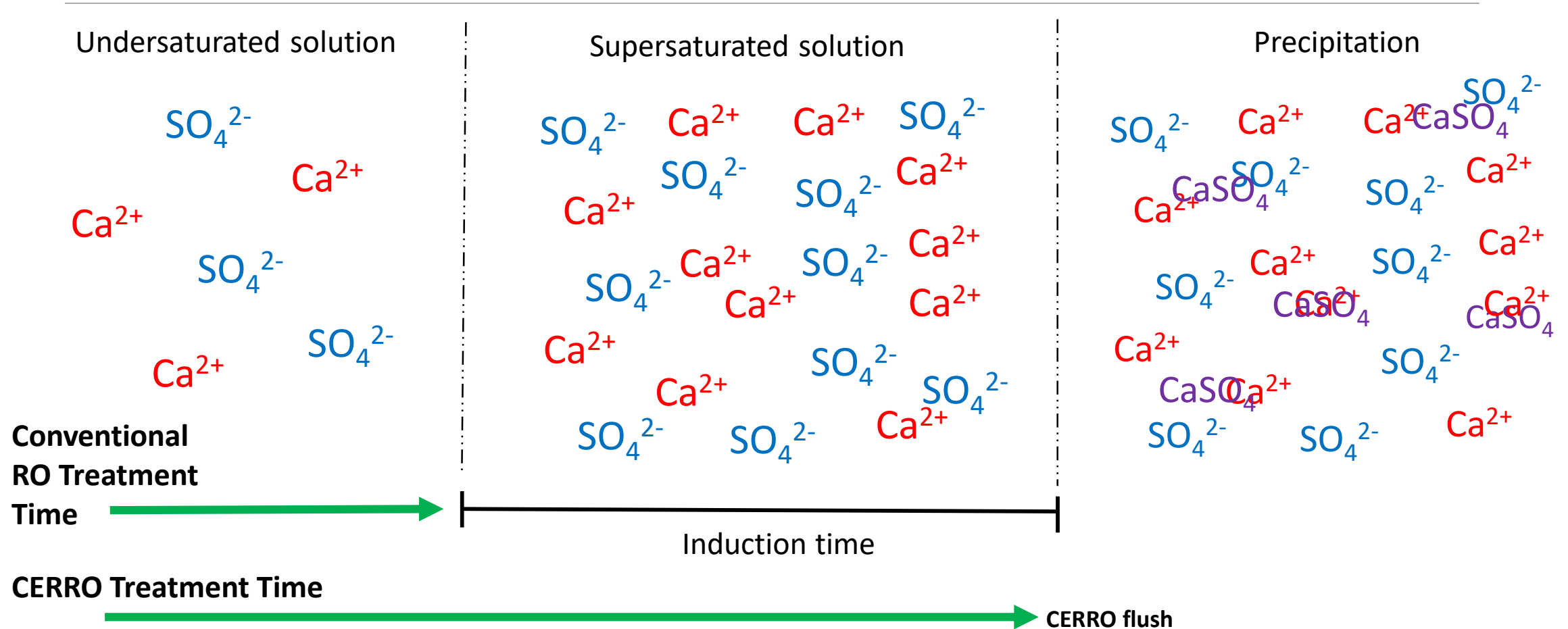
During this time, it was found that “Batch” Processes work better for Concentrate Desalination.

Induction Time of Mineral Formation.

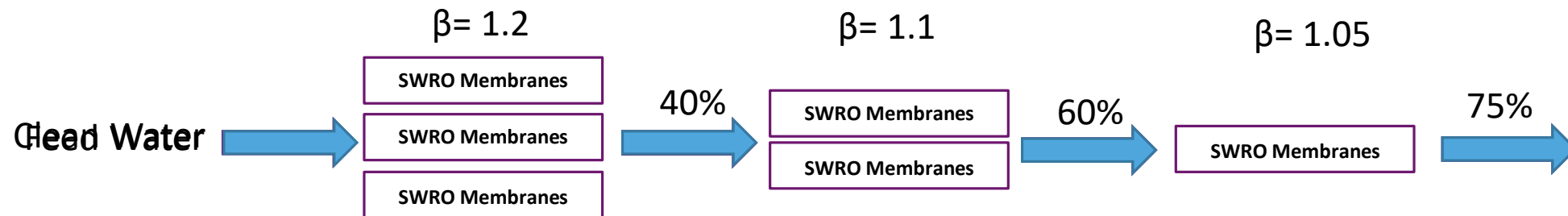


First CERRO Prototype

# Induction Time



# Single Pass CERRO System Schematic

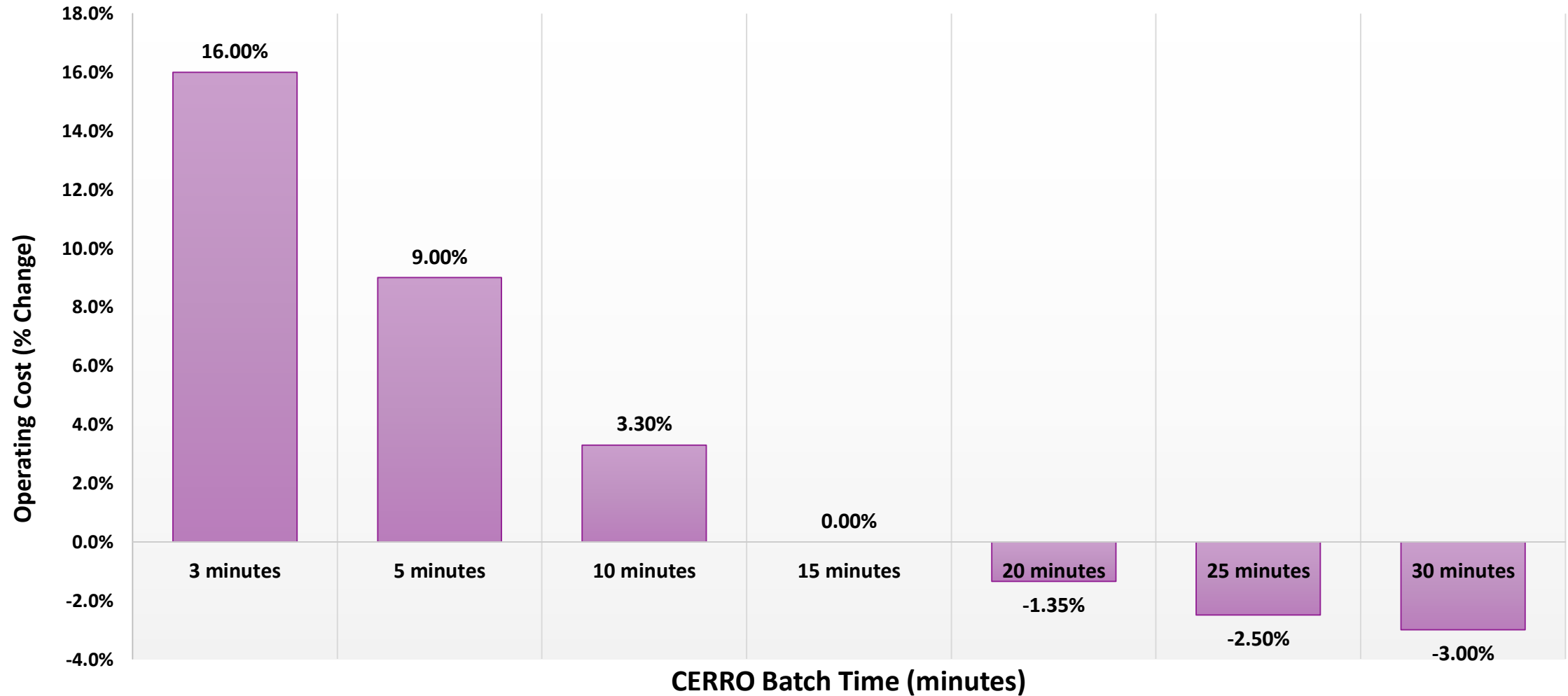


Batch Time: ~~20~~ 10 minutes

Flush Time: 1-3 minutes

$\beta$  = Concentration Polarization

# CERRO Batch Time and Operating Cost



# Well Site 412 Reverse Osmosis System



Courtesy of El Paso Water (EPW 2015)



# Well Site 412 @ El Paso, Texas

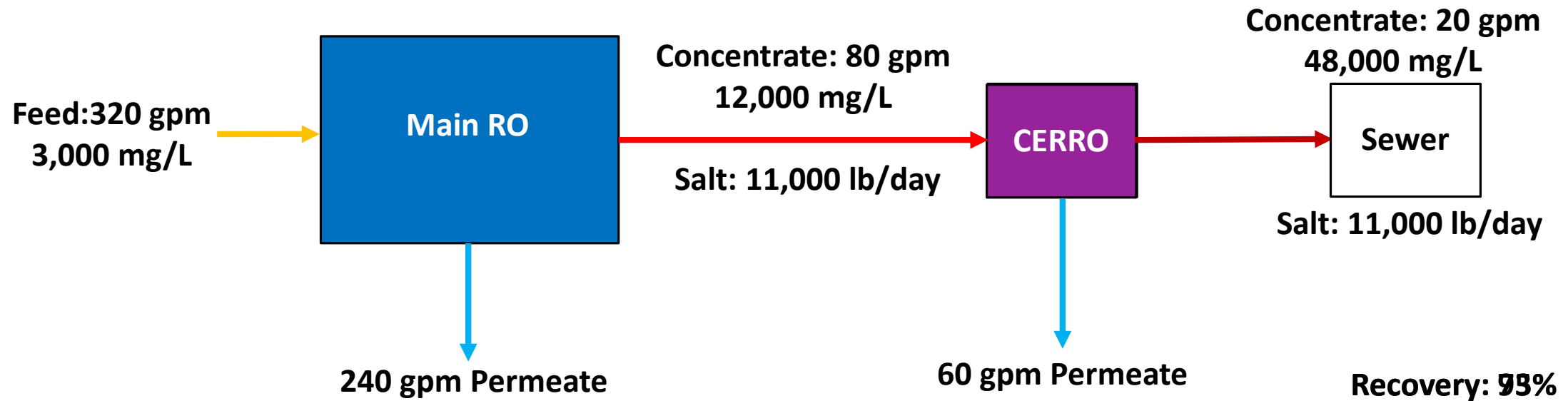
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# Confirmation Unit CERRO System – Well Site 412 <sup>9</sup>



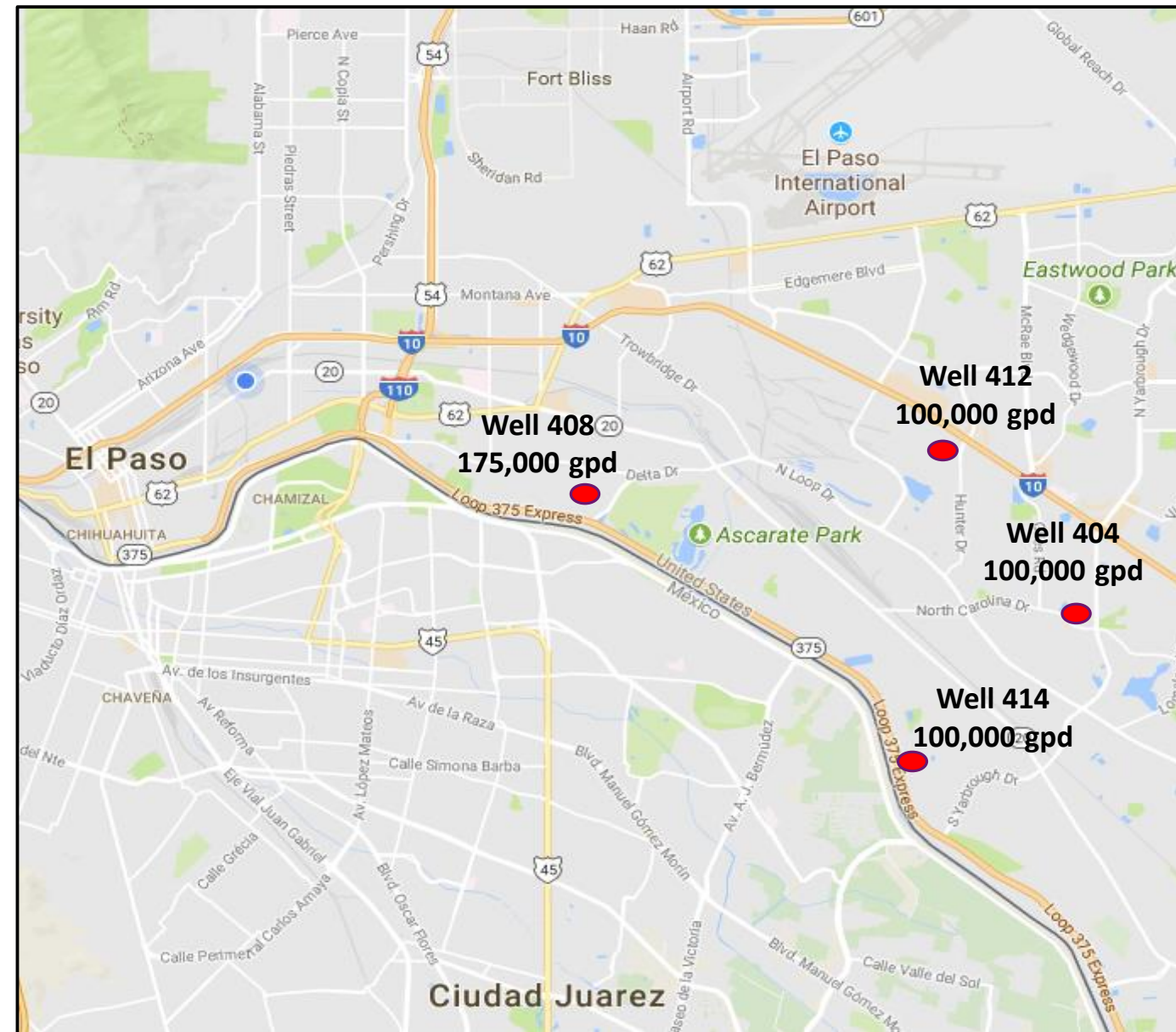
In 2015, El Paso Water (EPW) decided to install a full scale CERRO system at one of its well sites.



# New CERRO Systems

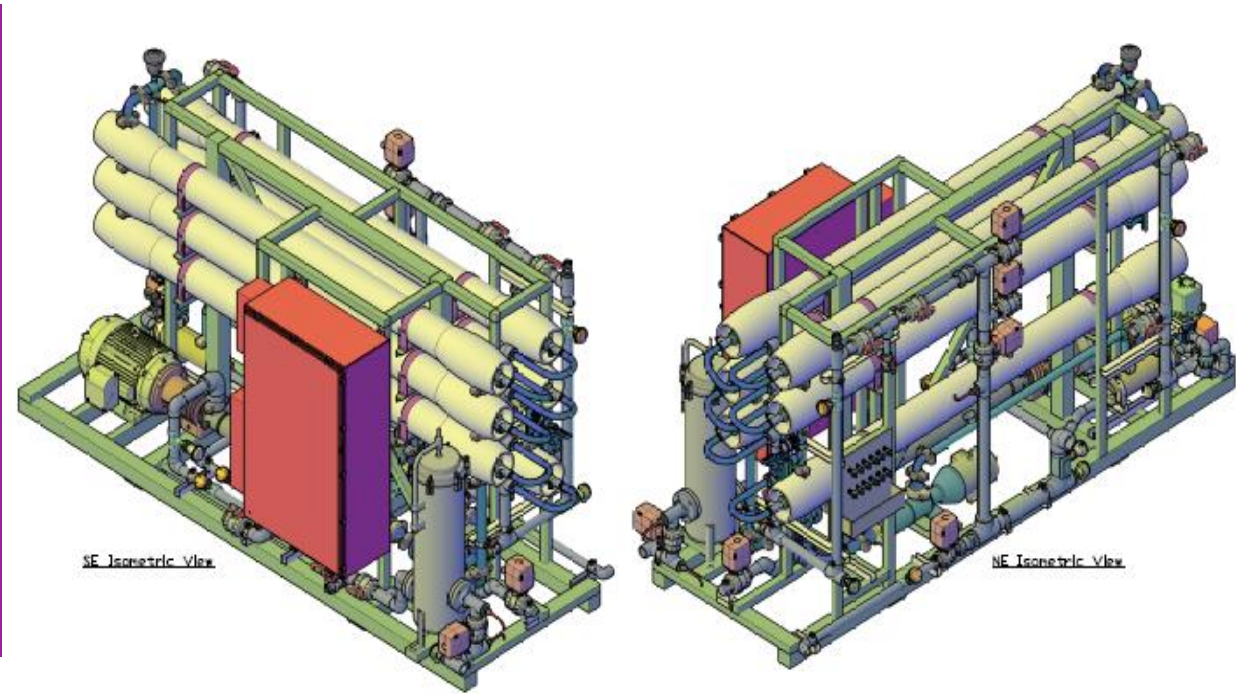
Based on the results of the first CERRO prototype, El Paso Water requested H2O-TERRA to design 3 new CERRO systems on three of their well sites.

- 475,000 GPD of Drinking Water
- Concentrate volume reduction >70%
- Partially funded by US Bureau of Reclamations

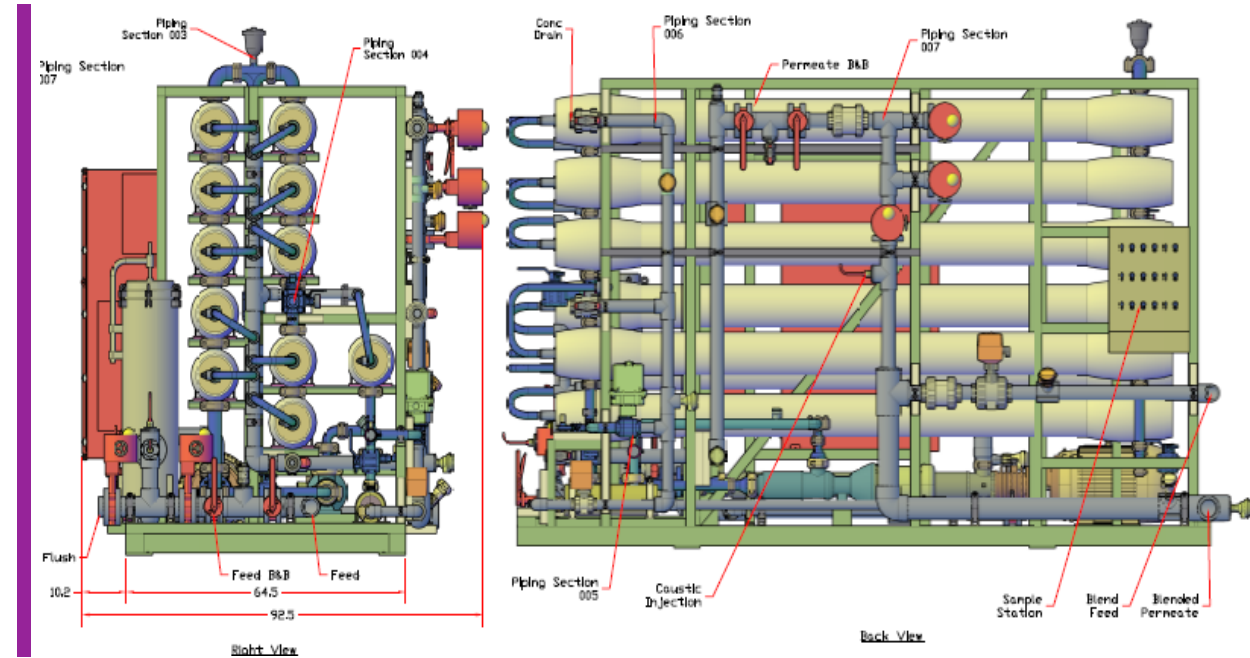


# CERRO Unit @ Well 414





# New CERRO Systems (80 gpm)



# New CERRO System (140 gpm)



One new system under construction (W-408)



# Texas Commission of Environmental Quality Permitting

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TCEQ Requires new desalination units to be tested for 15 days before approving a drinking water distribution permit for the systems.

- Water samples must be collected and analyzed by a TCEQ Certified Laboratory.
- Unit Performance must be within 10% of the values predicted by Reverse Osmosis models.
- Final Water Quality must meet all primary drinking water standards.



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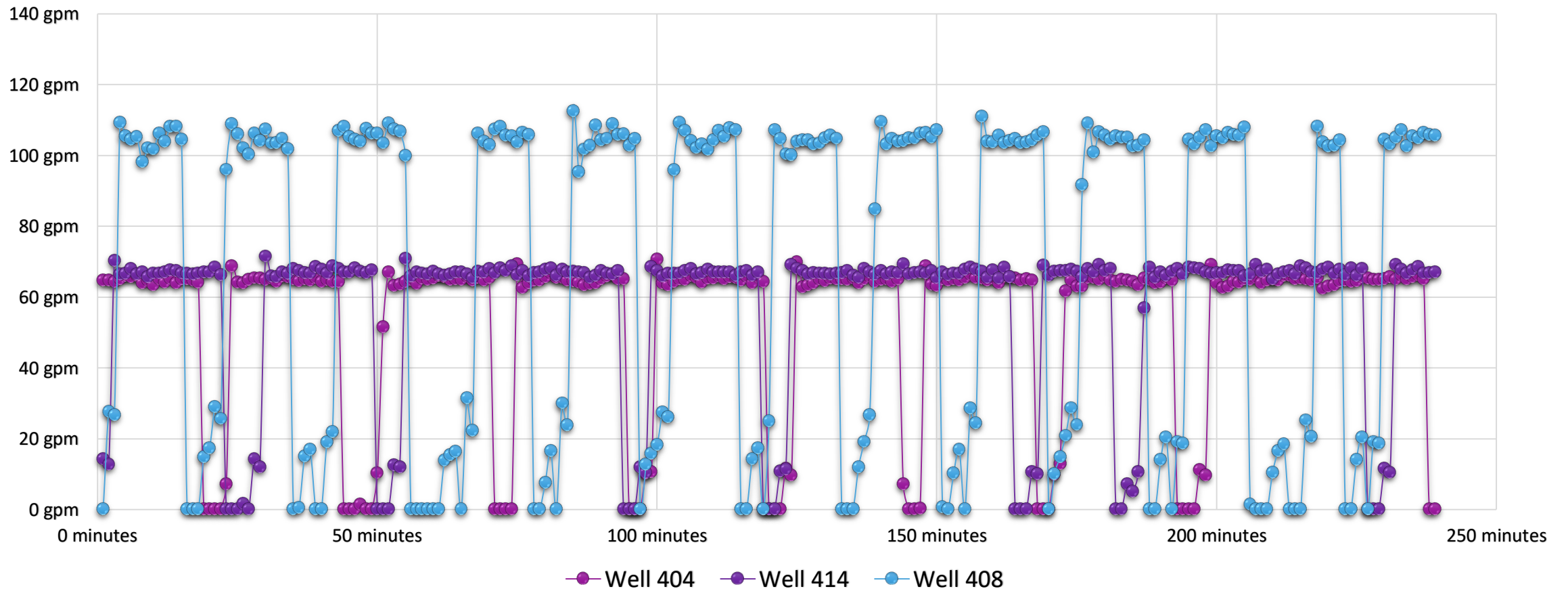
FIRE EXTINGUISHER



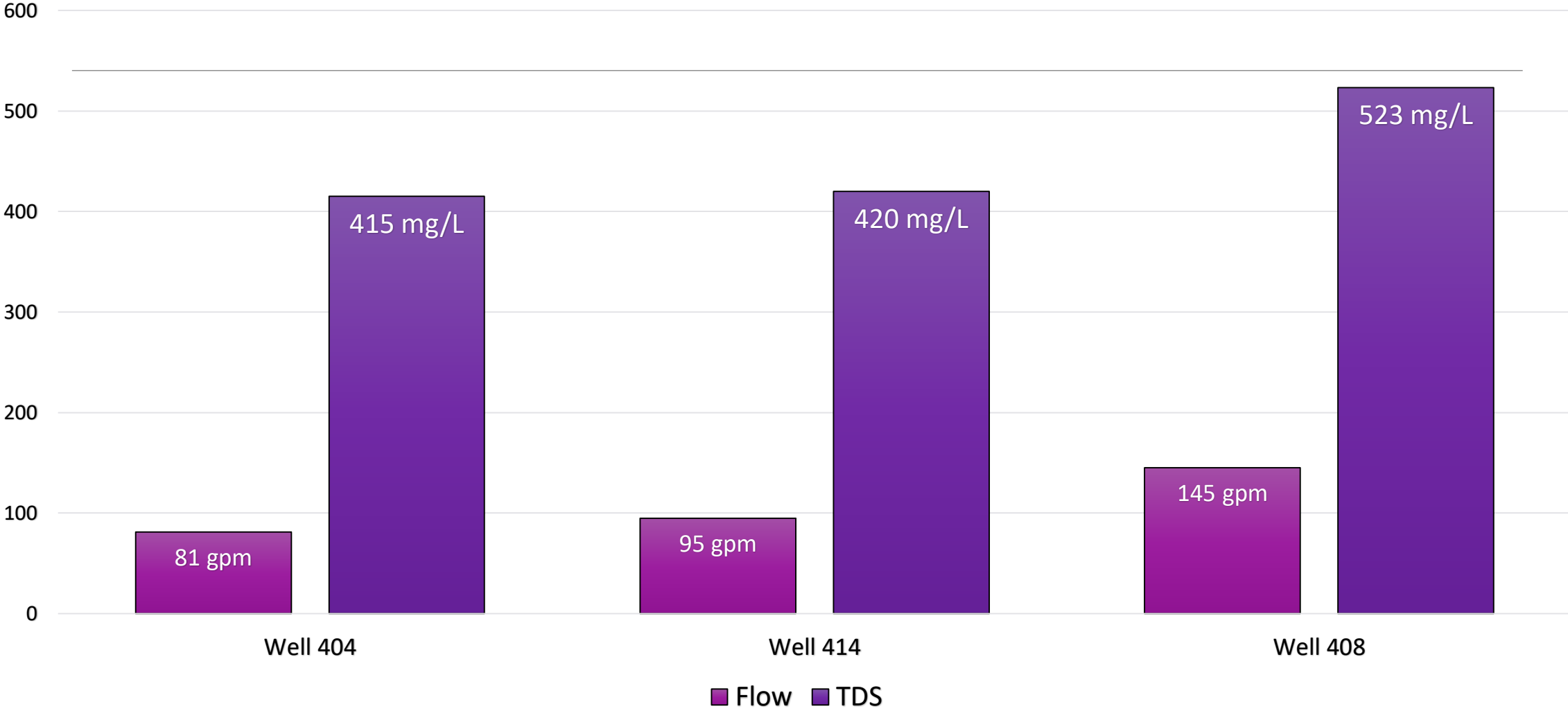


# CERRO Performance

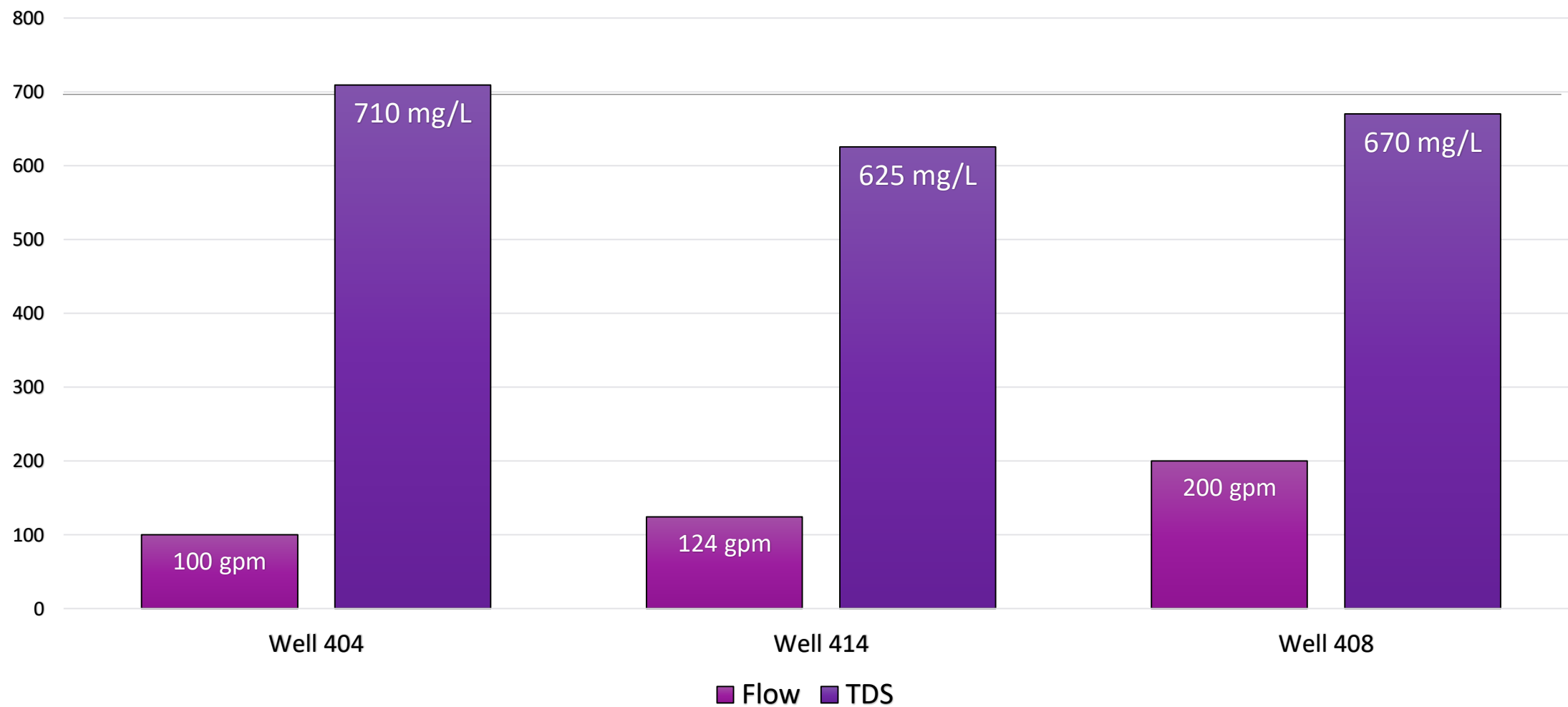
### CERRO BATCHES FOR EACH WELL SITE



# CERRO Final Blended Product

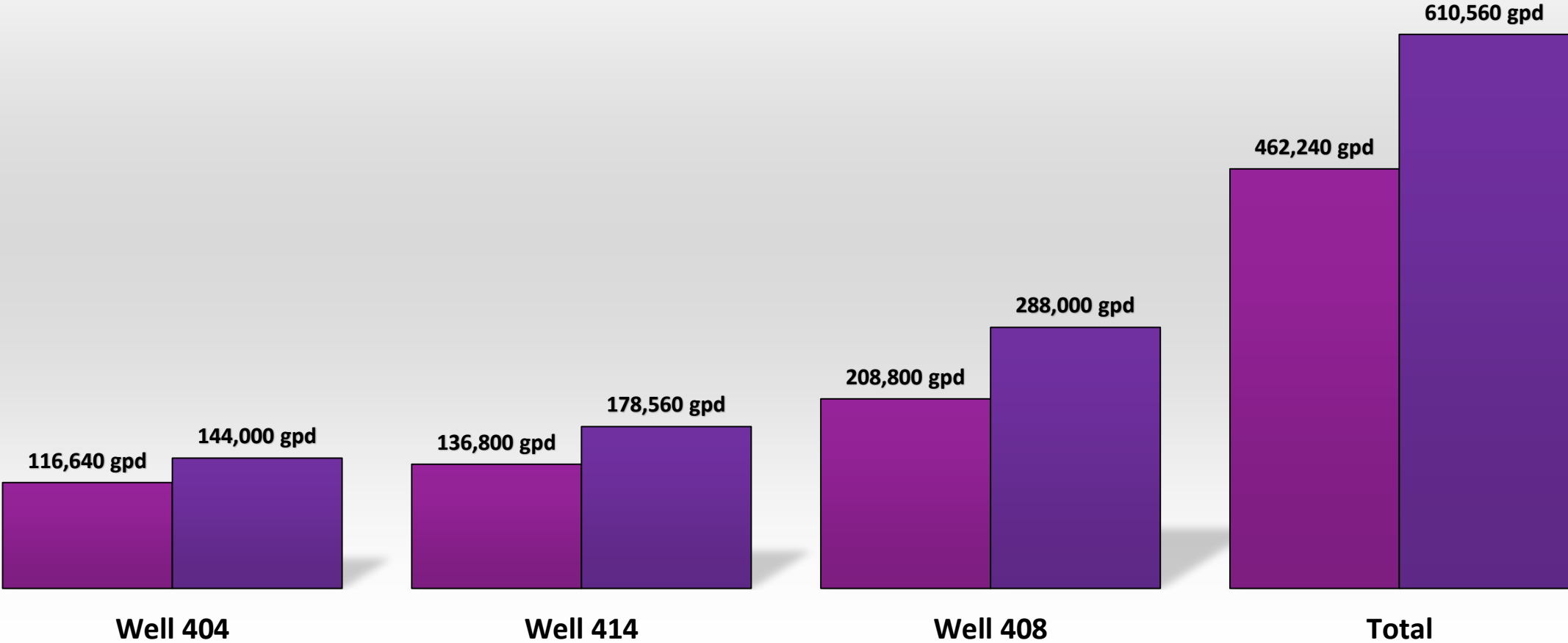


## CERRO Projected Final Product

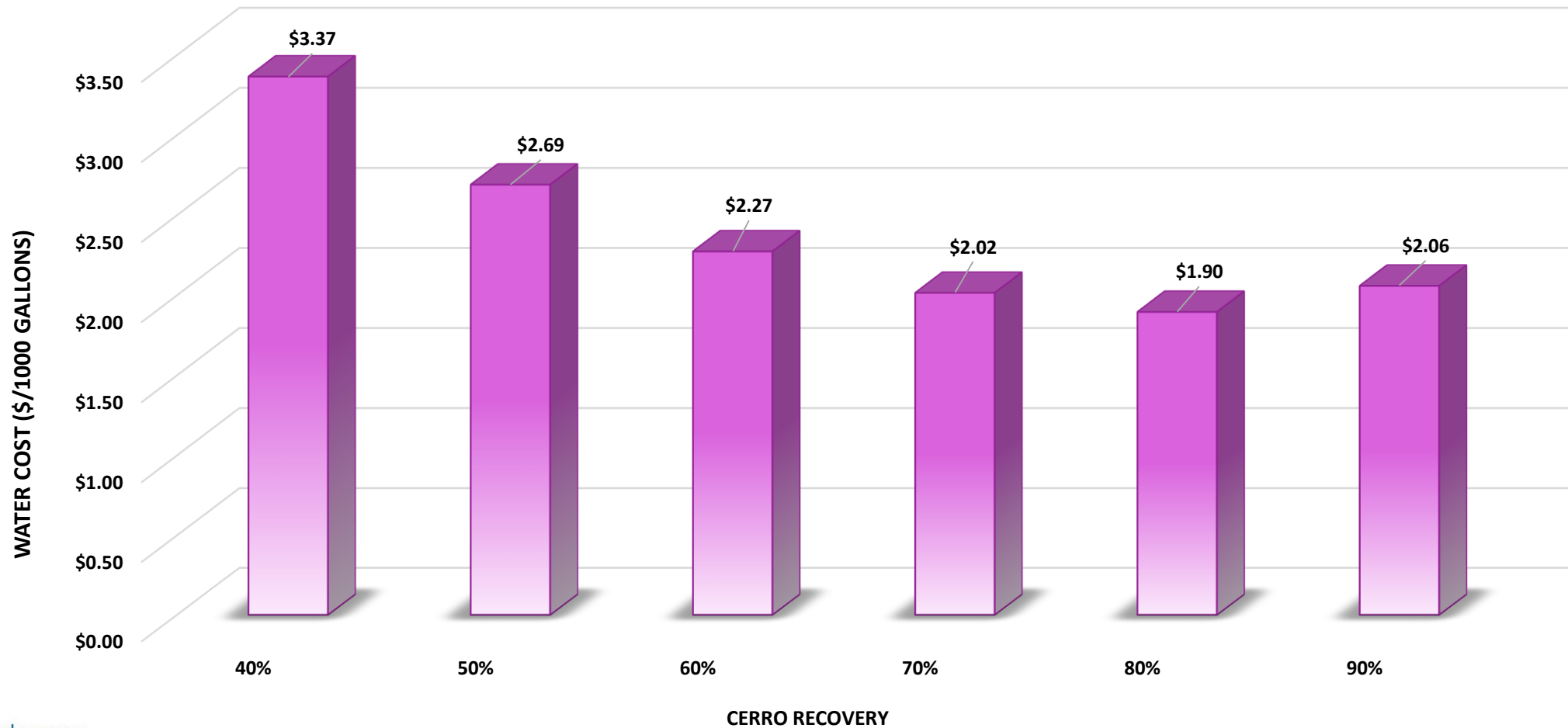


# Blended Product for all CERRO Units in Gallons per Day

■ 15 Day Blend ■ Final Blend



### CERRO Cost (USD per 1000 gallons)



# Thanks for Your Time

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“The most valuable of all talents is that of never using two words when one will do.”

- Thomas Jefferson

