

# FYI in 45 Reverse Osmosis: What Can It Do For You?

Panelists:  
Cecile Toupiol  
Colin Hobbs

Moderated by:  
Andrew Beaton

*July 31, 2018*



**CDM  
Smith**

# Today's Discussion Includes...

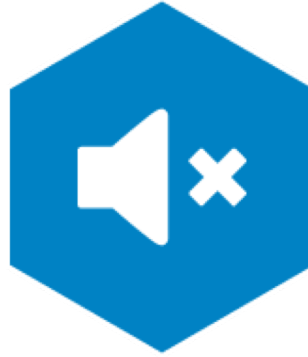
- ▶ Investments and advances in RO technology that are making it more valuable than ever
- ▶ Strategies for dealing with concentrate left over from the RO process
- ▶ How reverse osmosis is an important solution to some of our biggest future water challenges



# Before We Begin...



**Recording  
in progress**



**All phones  
are on mute**



**Questions  
encouraged**

# Our Panel



**Cecile Toupiol, PE**  
Principal, Senior Environmental Engineer

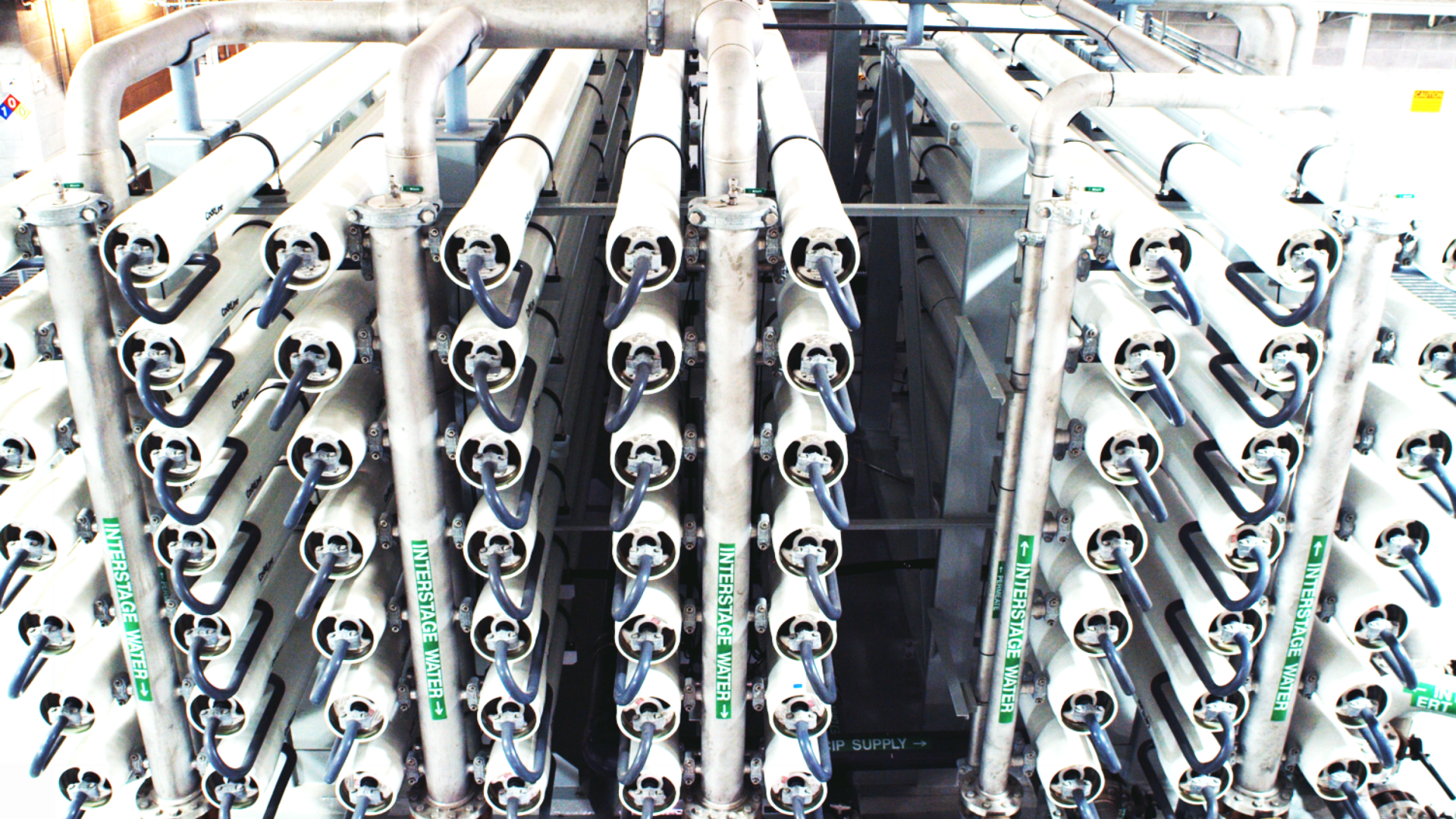


**Colin Hobbs, PhD, PE, BCEE**  
Principal, Senior Environmental Engineer



# Membranes & Reverse Osmosis 101





INTERSTAGE WATER →

INTERSTAGE WATER →

INTERSTAGE WATER →

→ INTERSTAGE WATER

→ INTERSTAGE WATER

SHIP SUPPLY →

INTERSTAGE WATER →

# Reverse Osmosis Applications Include...



Desalination

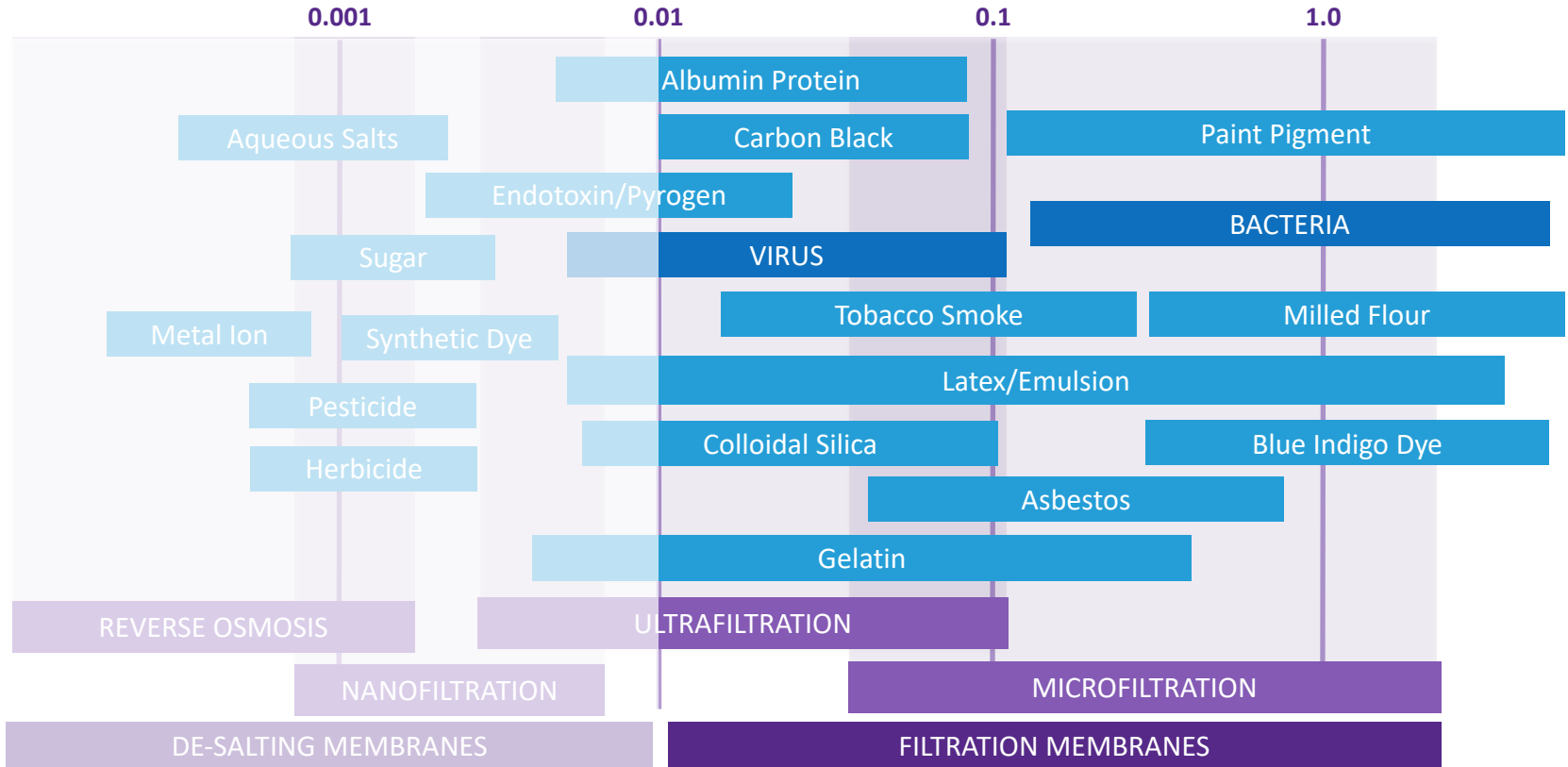


Softening

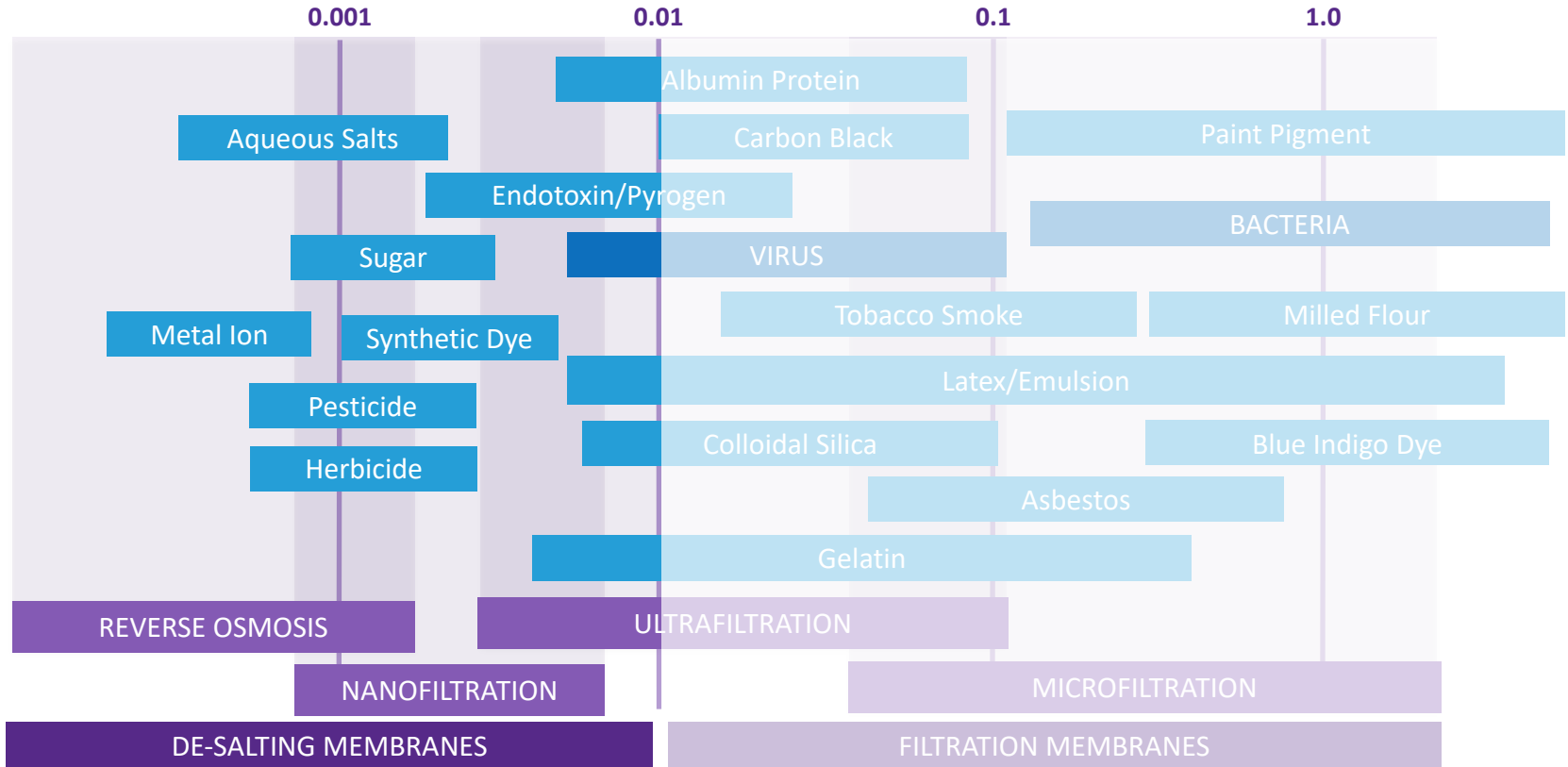


Reuse

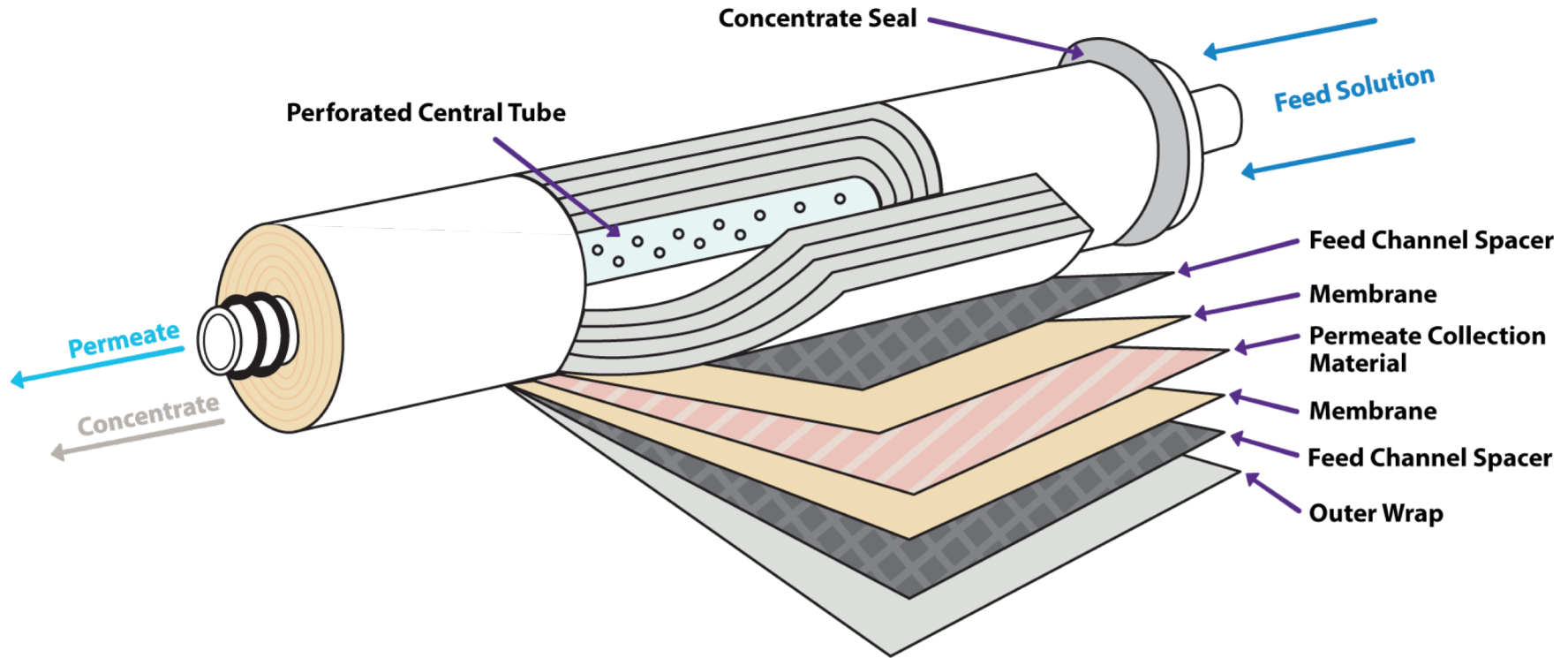
# Two Types of Membranes



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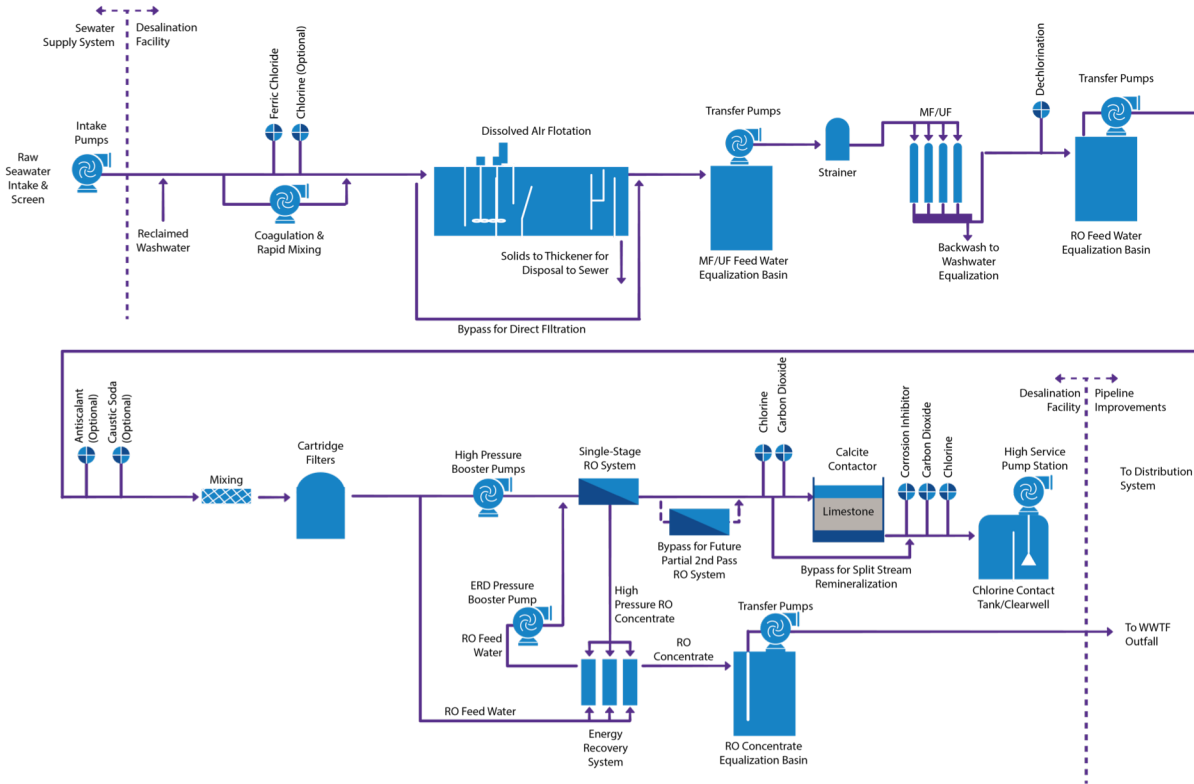


# Desalination Basics



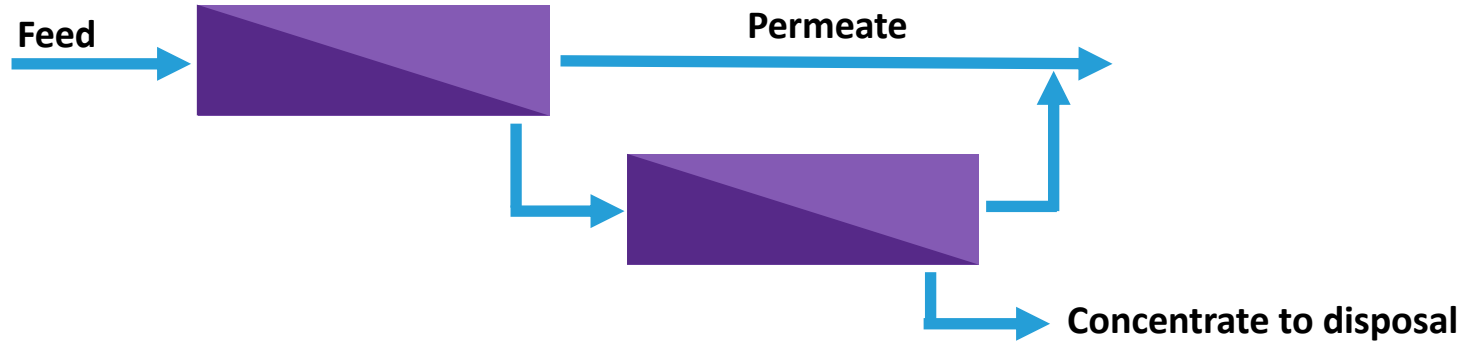


# Seawater Desalination Process

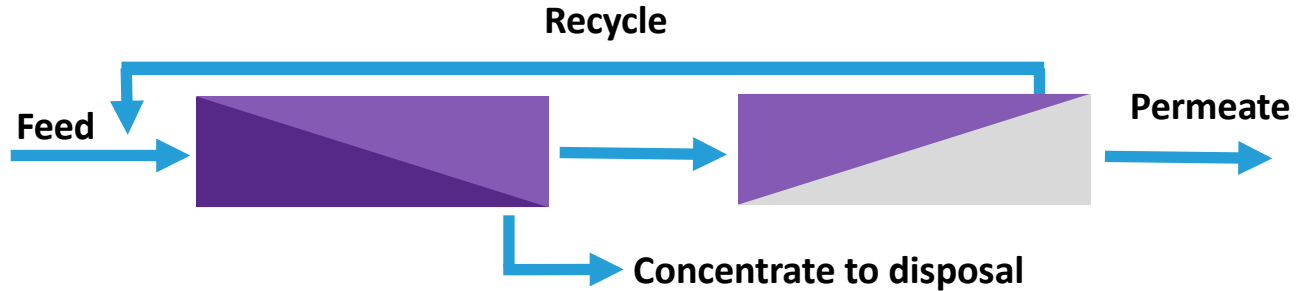


# Stages vs. Passes

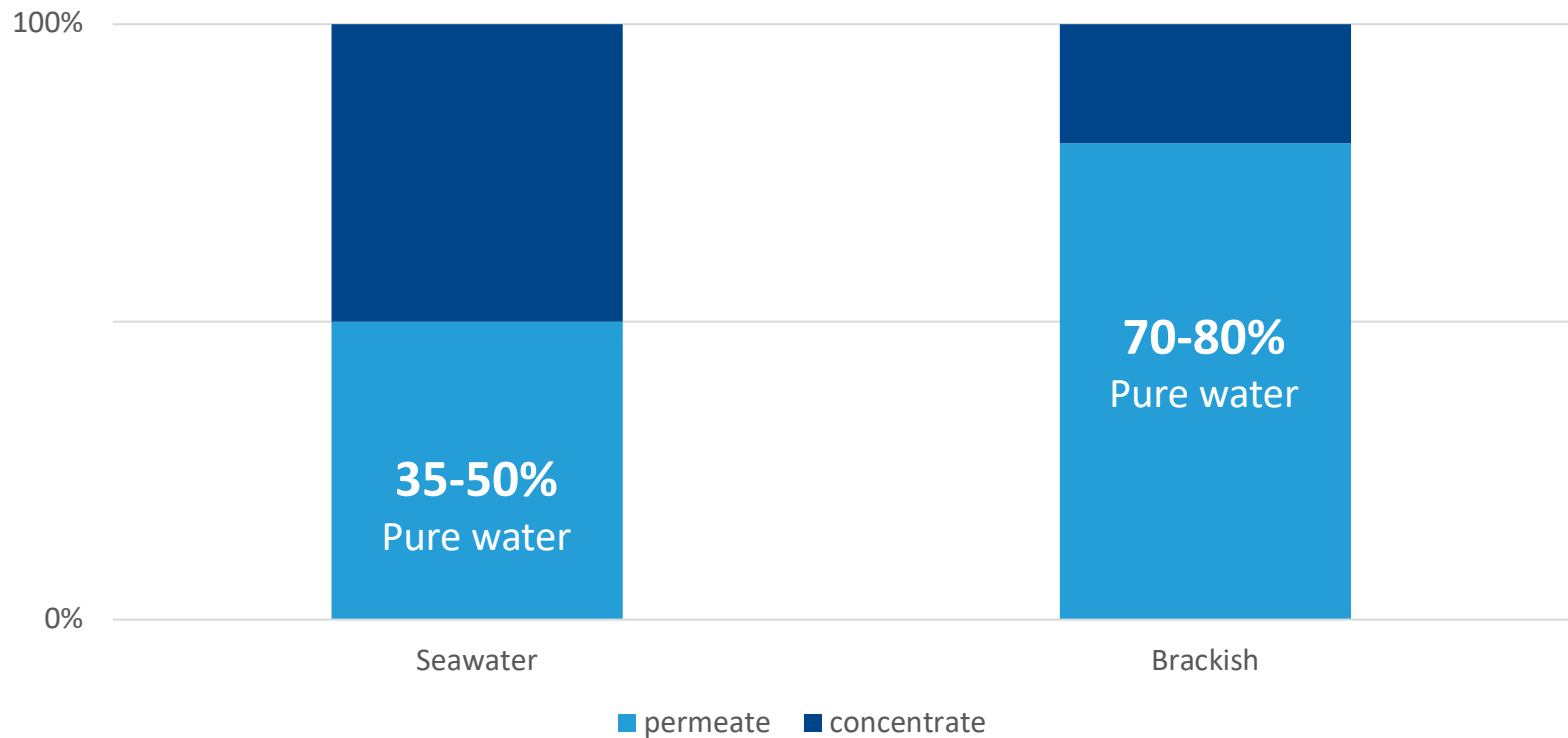
## Stages



## Passes



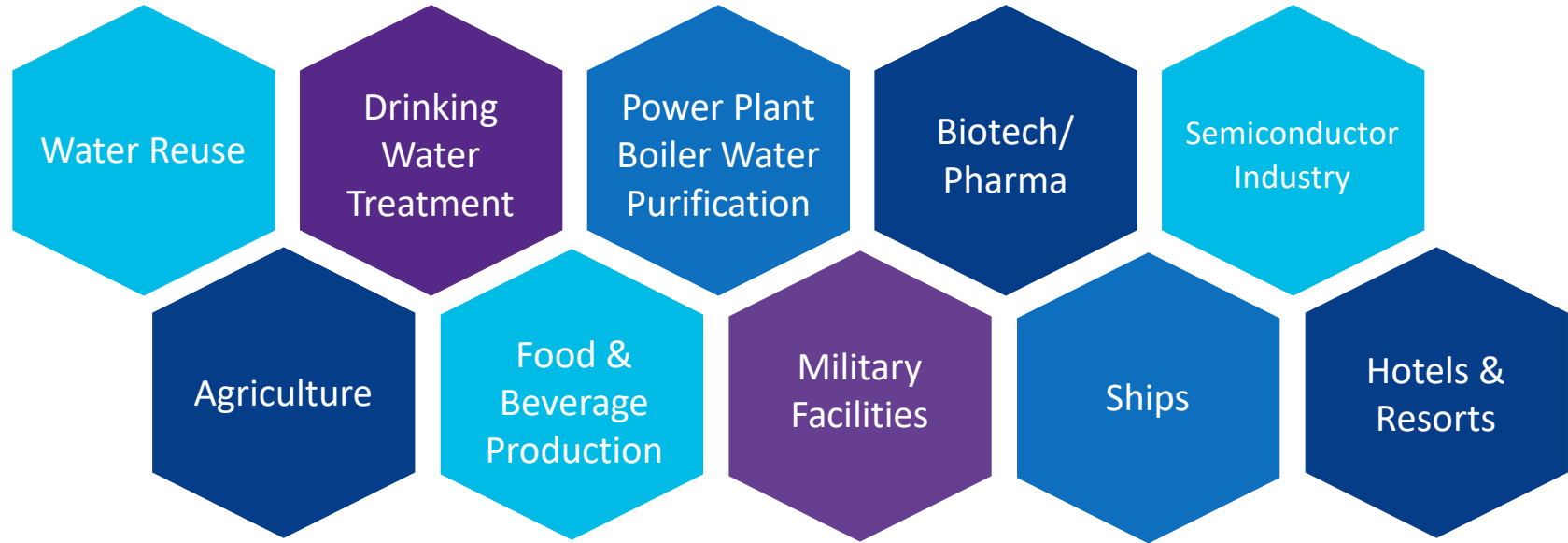
# Typical Permeate Yields



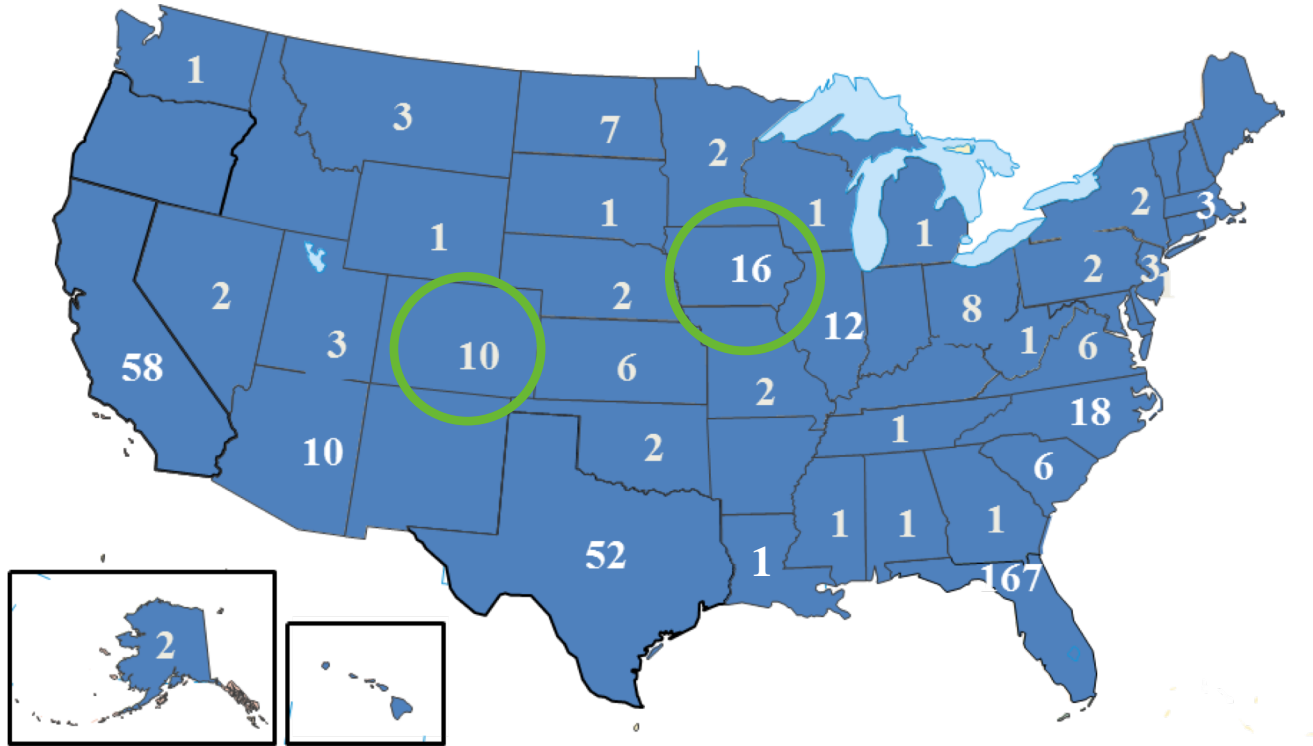


# Evolution of Membrane Technology & Practice

# Applications of Membrane Technology



# Desalination is Proliferating...Even Far Inland



# Improvements in Technology



Tailored  
Membrane  
Systems

# Improvements in Technology



Tailored  
Membrane  
Systems



Higher  
Efficiency



# Improvements in Technology

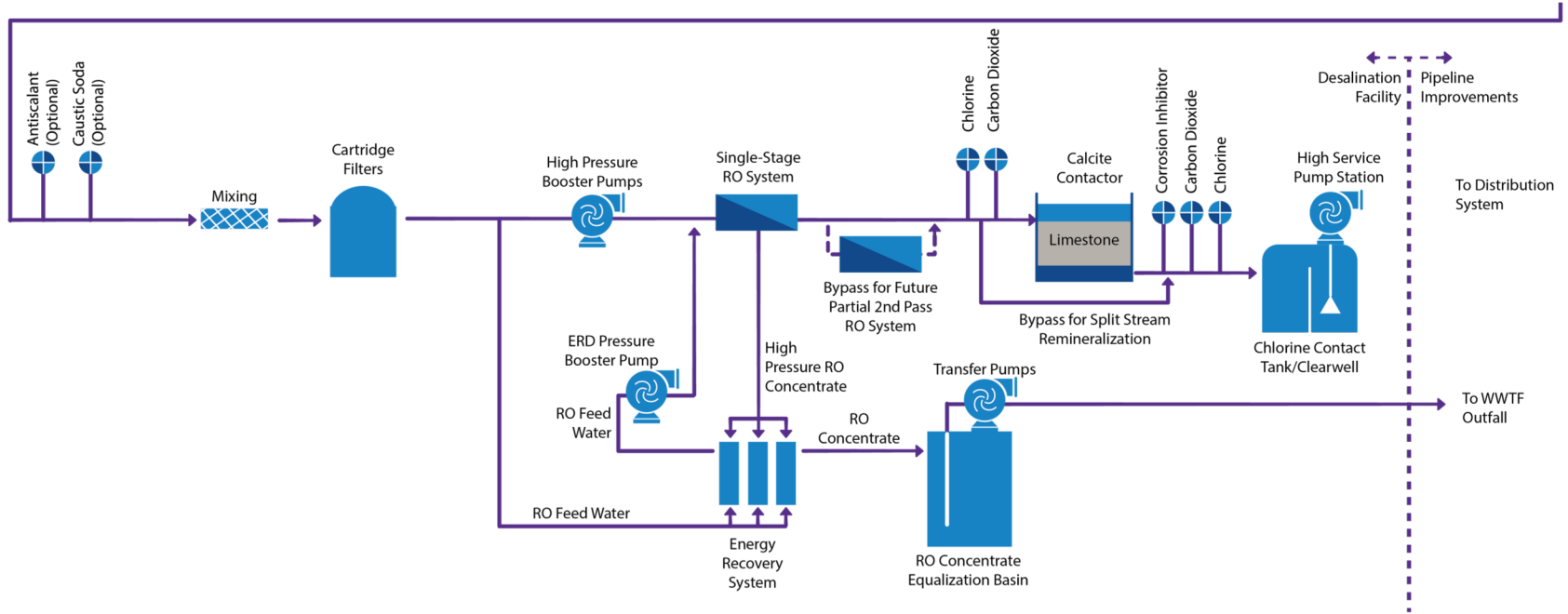


Tailored  
Membrane  
Systems

Higher  
Efficiency

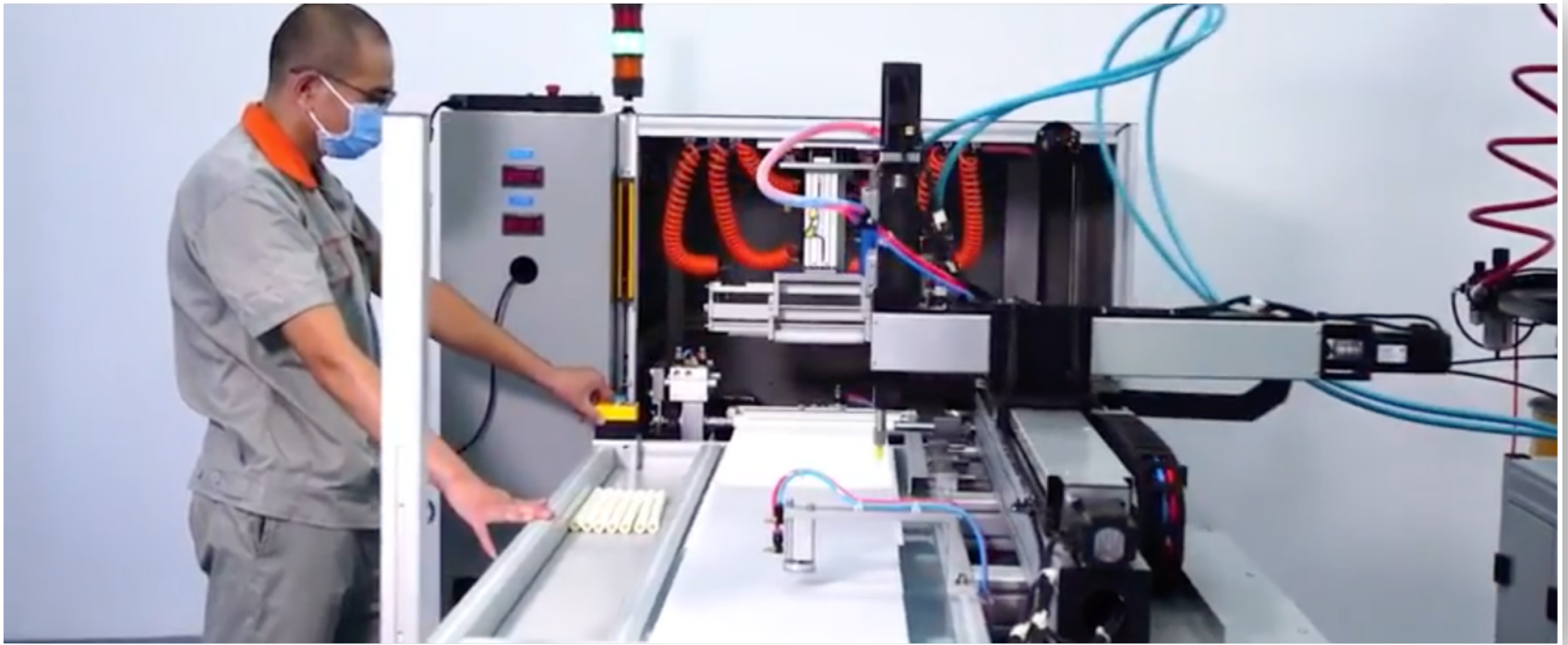
Better  
Energy  
Recovery

# Energy Recovery





# Improvements: Manufacturing Automation





# Concerns & Considerations

# Universal Concentrate Considerations



Quality and  
Quantity of  
Concentrate

Environmental  
Permitting

Testing and  
Monitoring

Geographic  
Considerations



Surface Water

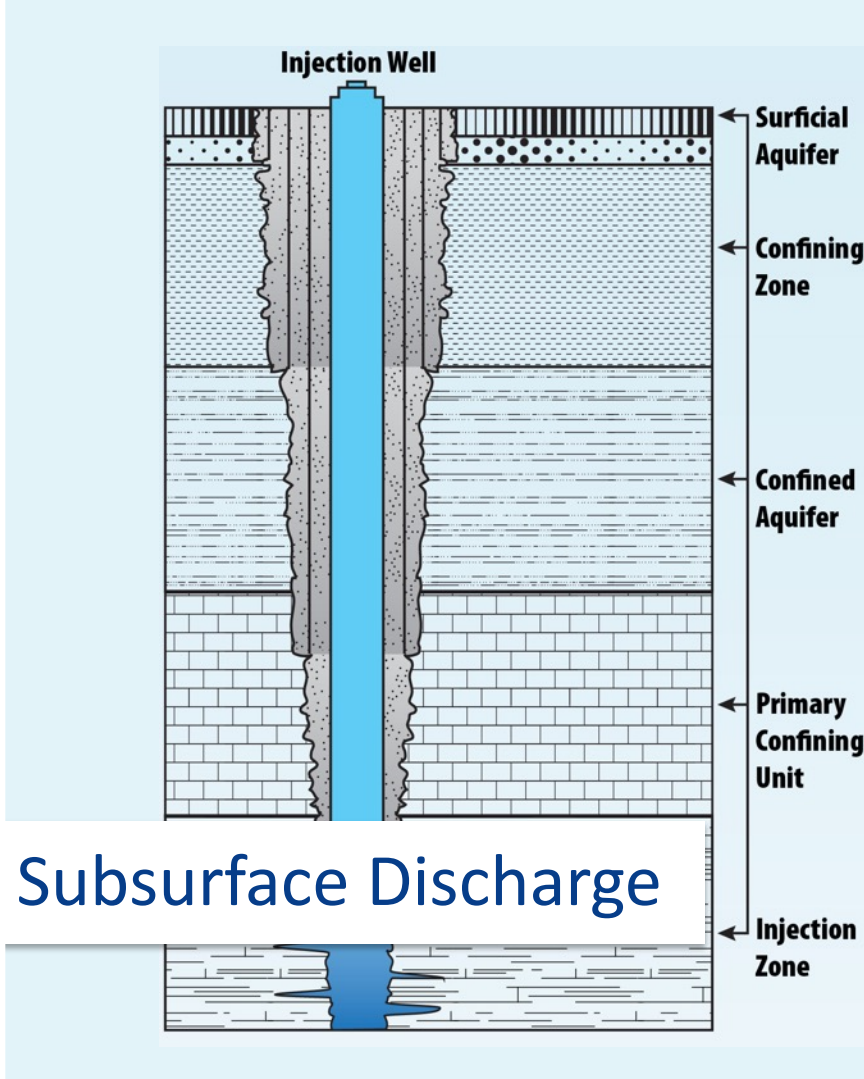


Land Application





Sanitary Sewer Discharge



Subsurface Discharge

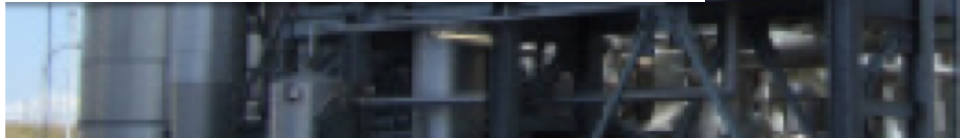




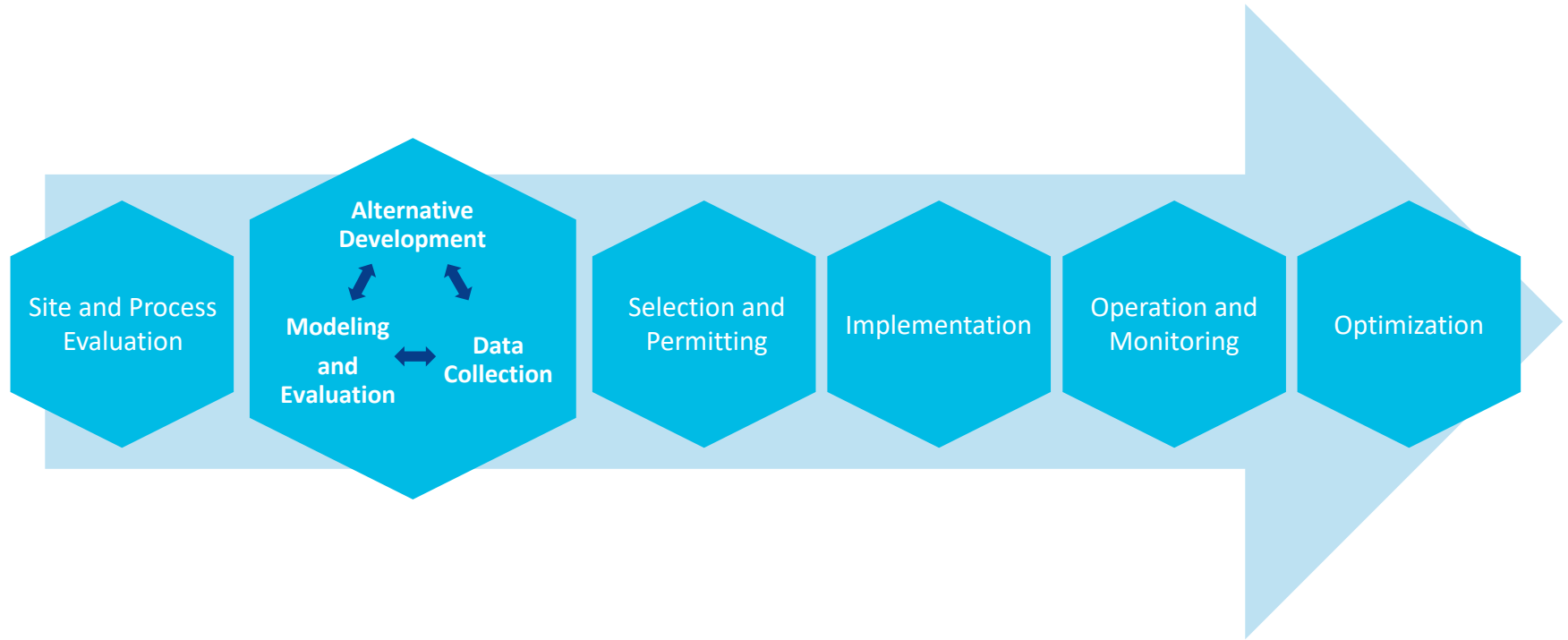
Evaporation



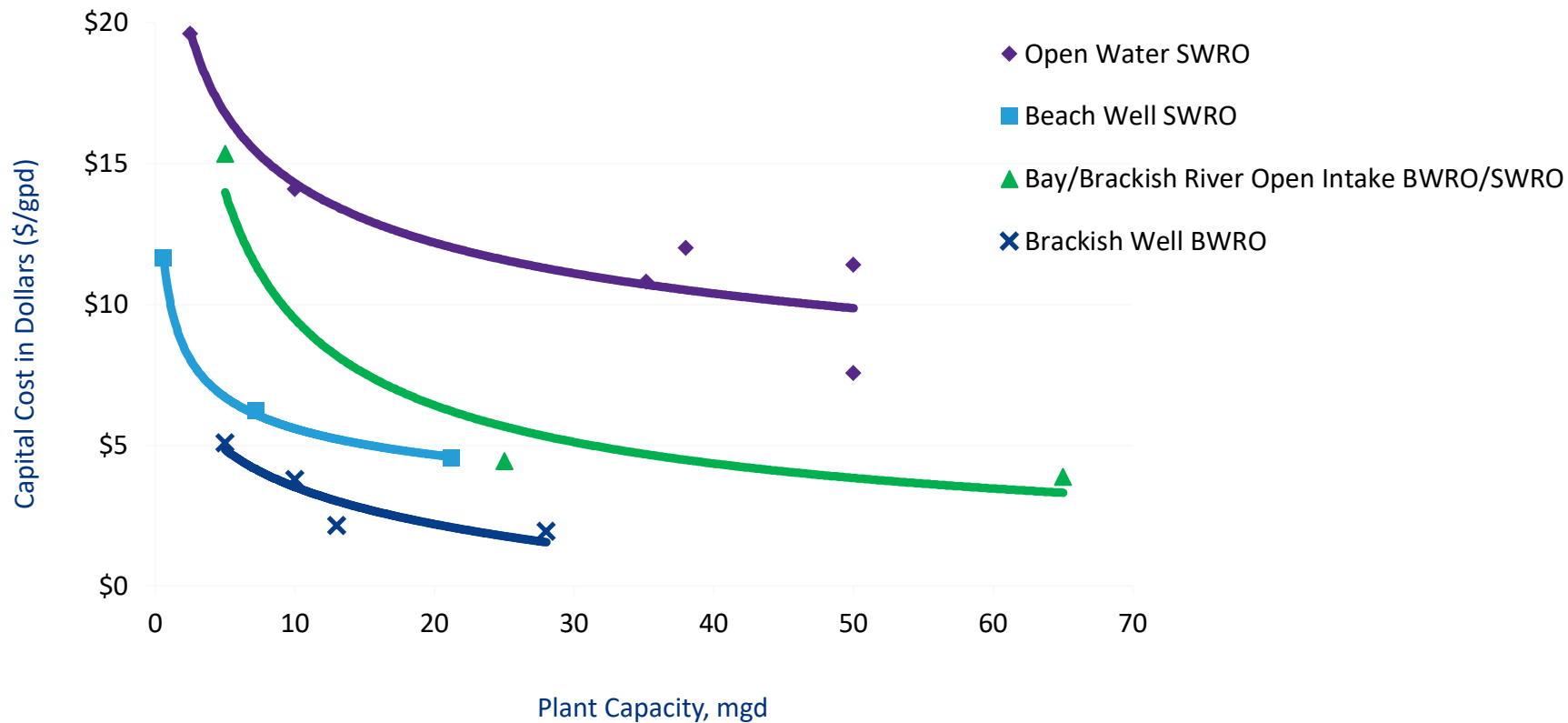
Zero Liquid Discharge



# Every Facility is Unique



# RO Capital Costs





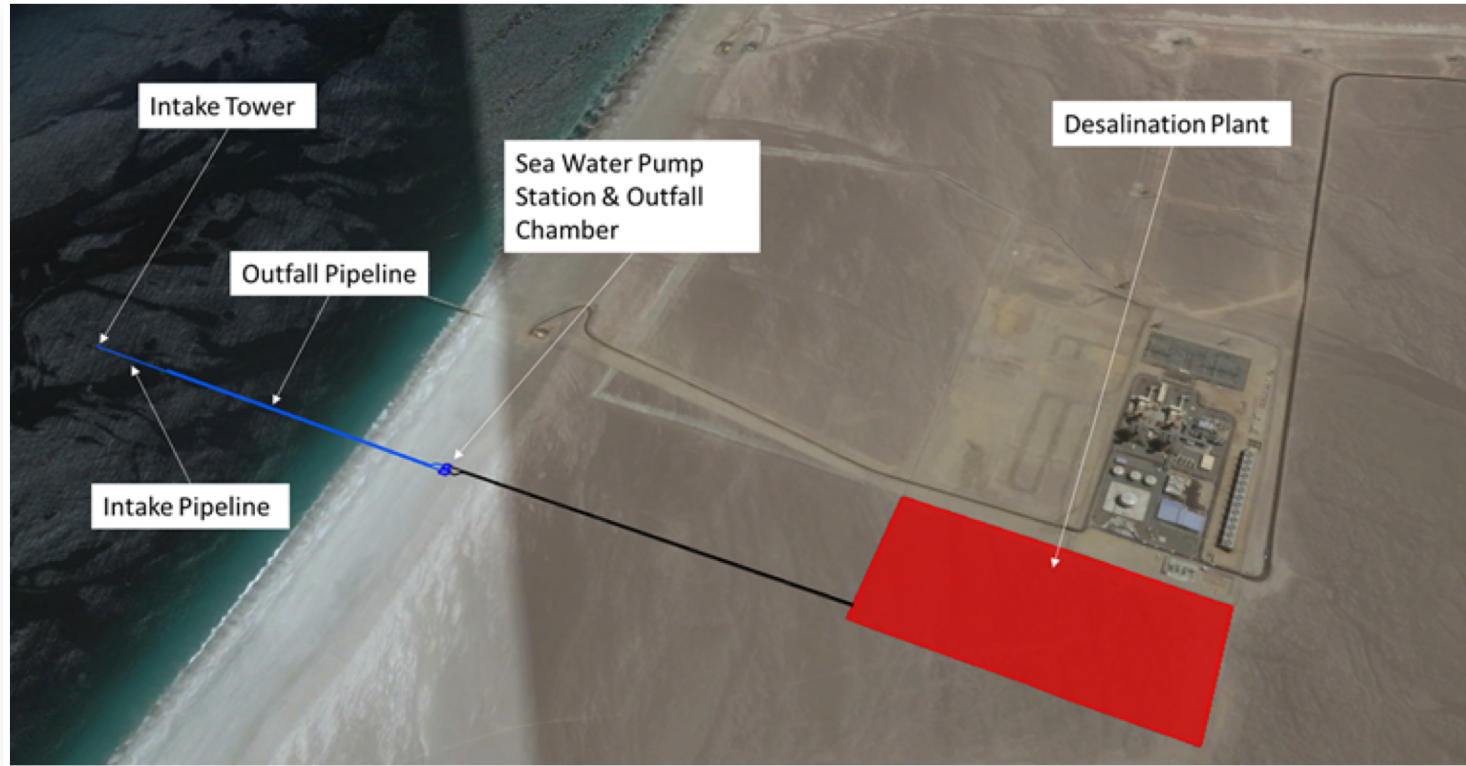
# Case Studies



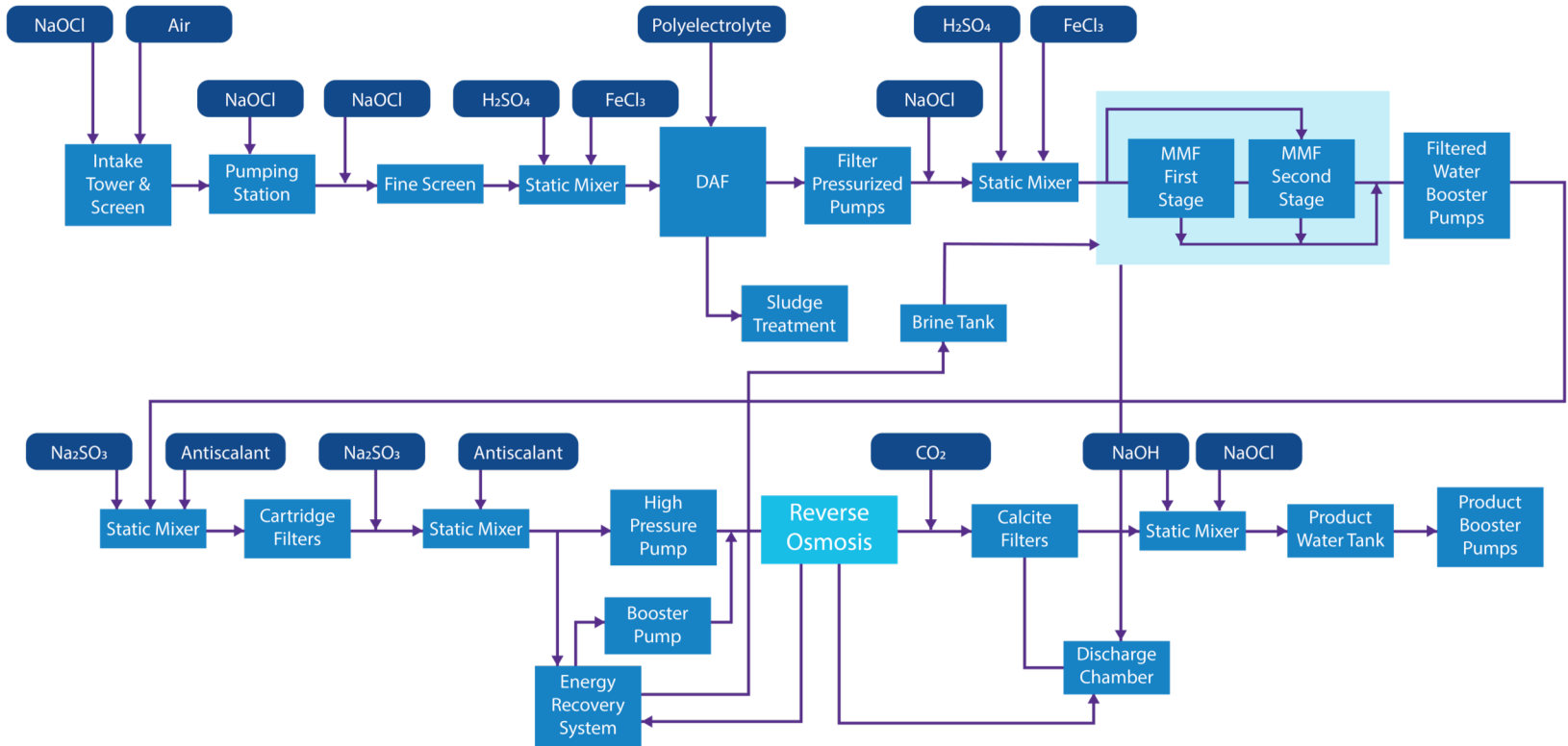
# SGO Mining SWRO



# SGO Project Overview



# SWRO Desalination Plant



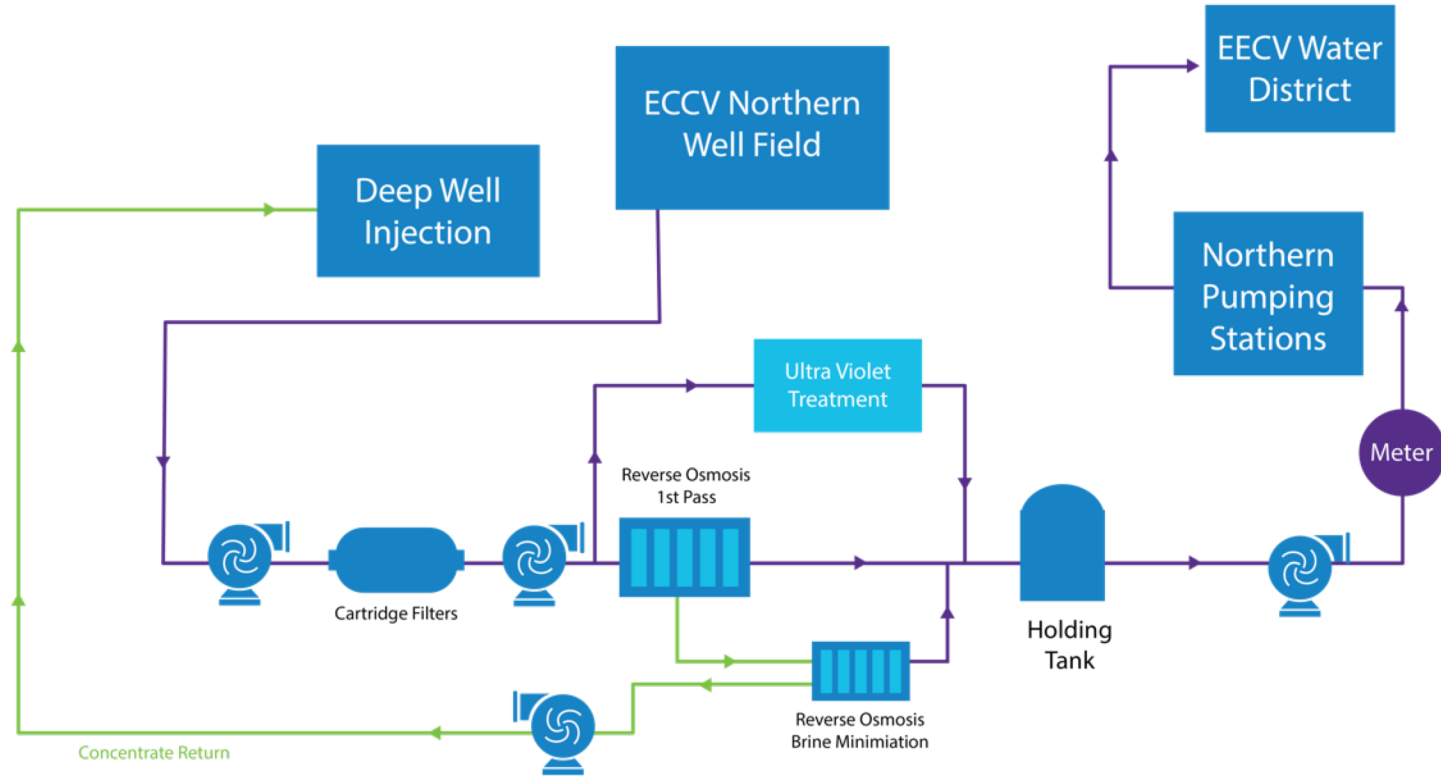


# East Cherry Creek Valley





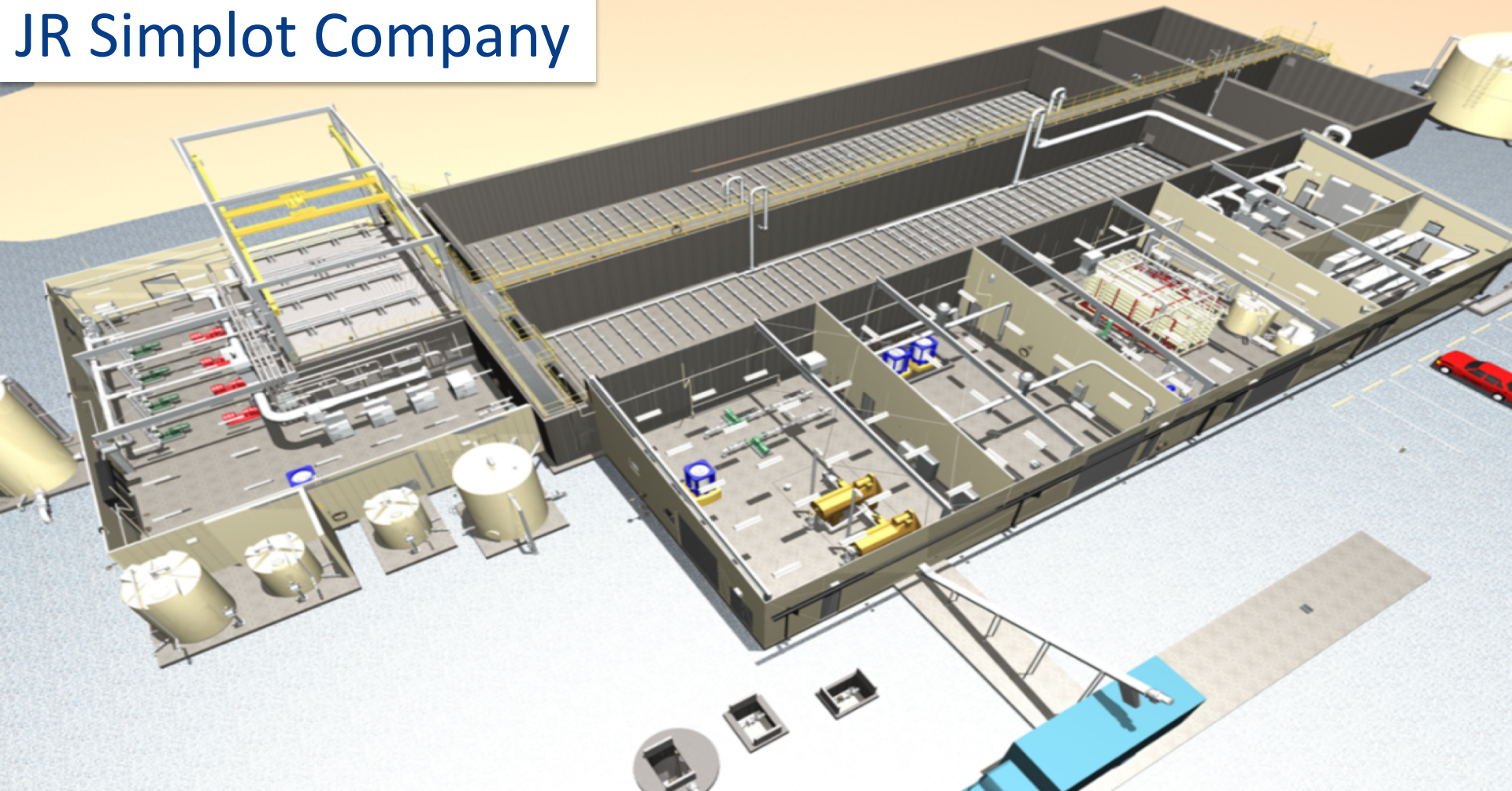
# East Cherry Creek Process



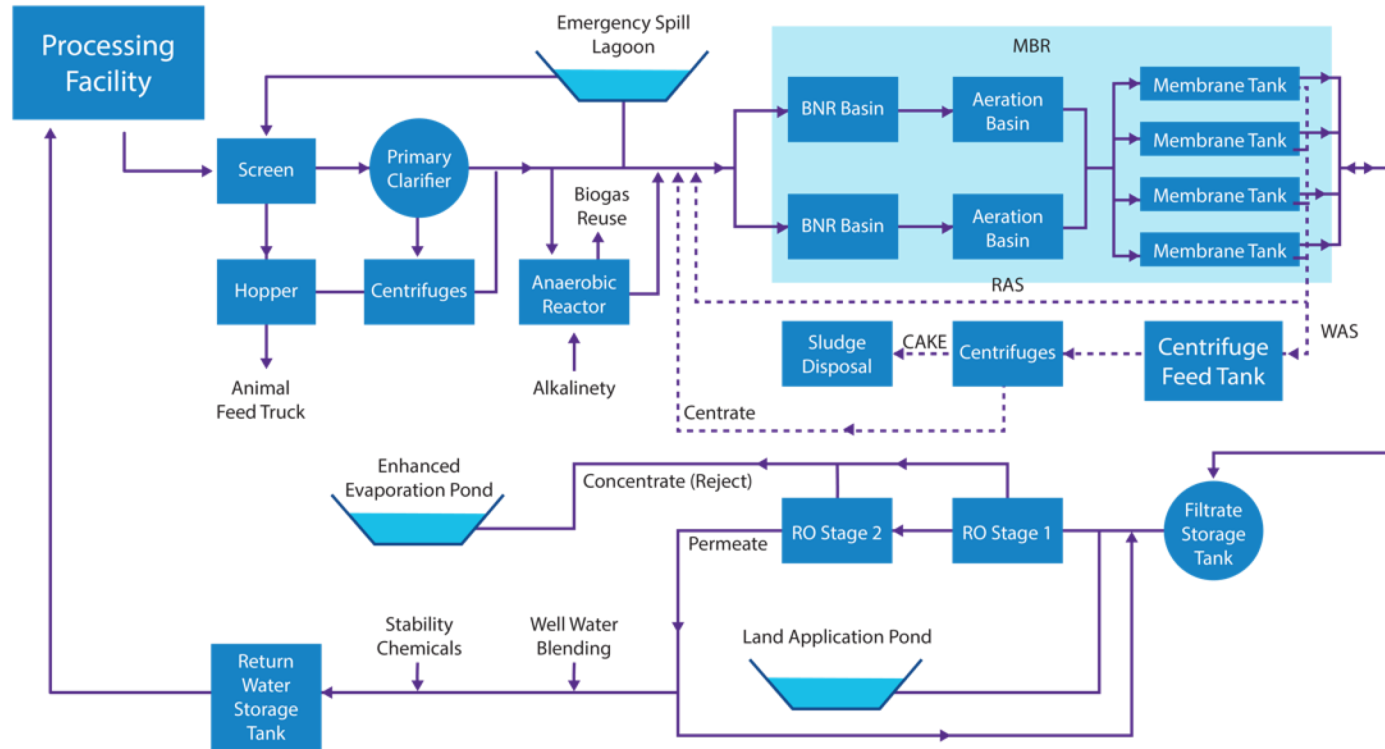




# JR Simplot Company



# JR Simplot Company – Facility Process





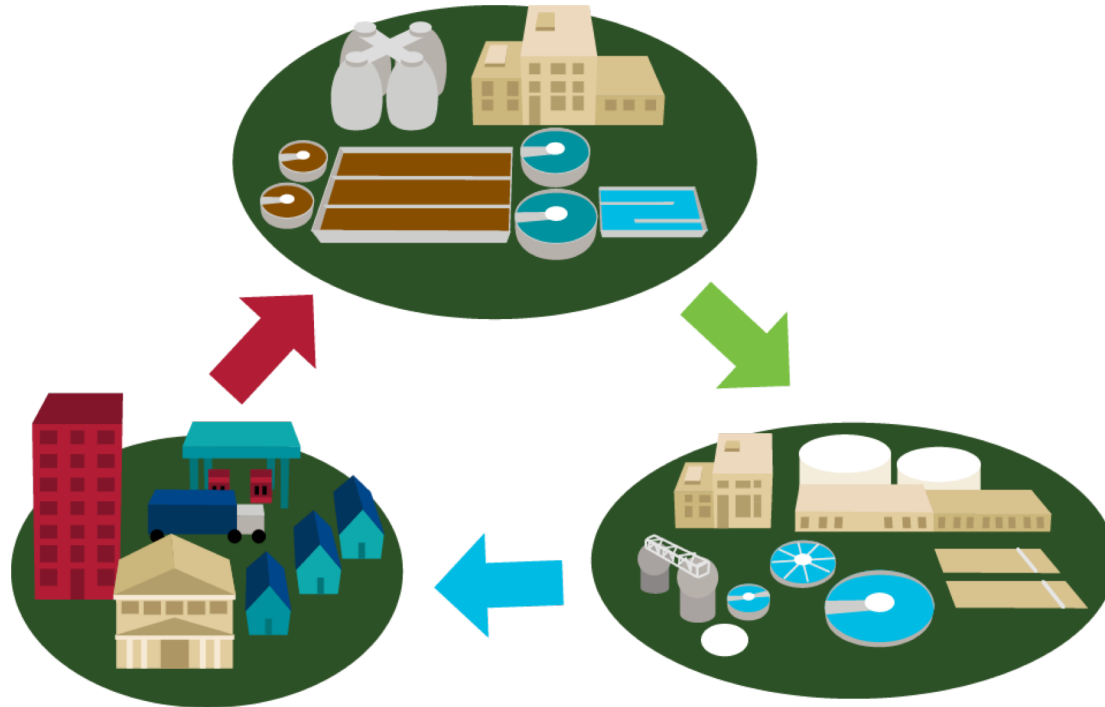






# Ongoing Research

# Potable Reuse



# Emerging Contaminants



Water  
Contaminated  
with PFAS

## Treatment Process Options



1

Granular Activated Carbon

2

Ion Exchange

3

**Reverse Osmosis**



PFAS Safe  
Water



What's Next?

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- ▶ Dealing with Algae Blooms



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- ▶ Membrane Materials



# Questions & Answers



# Contact Information

## Panelists



**Cecile Toupiol, PE**

Principal, Senior Environmental  
Engineer  
ToupiolC@cdmsmith.com



**Colin Hobbs**

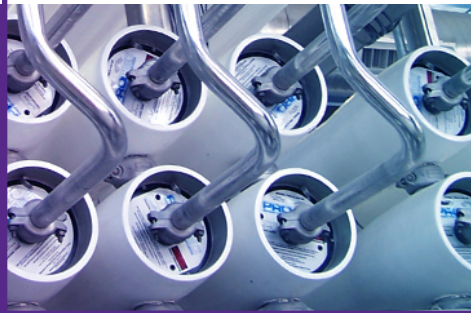
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## Moderator



**Andrew Beaton**

Principal, Marketing Manager  
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Thank You