



EASTERN MUNICIPAL WATER DISTRICT
Brine Management for Purified Water
Replenishment



Multi-State Salinity Coalition
2018 Annual Salinity Summit



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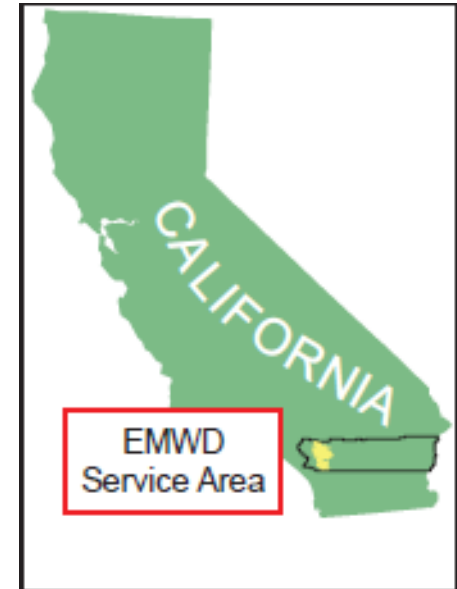
February 8, 2018

Agenda

- About Eastern Municipal Water District
- Groundwater Reliability Plus Overview
- Brine Management Alternatives
- Brine Management Design Considerations

About Eastern Municipal Water District

- Provides water, wastewater, and recycled water services to ~761,000 people
- 555-square mile service area in Riverside County
- Water supply
 - 13% from local groundwater sources
 - 29% from EMWD's recycled water supply
 - 58% imported water
- Additional water supply options were analyzed in the Integrated Resources Plan
 - Recommended indirect potable reuse

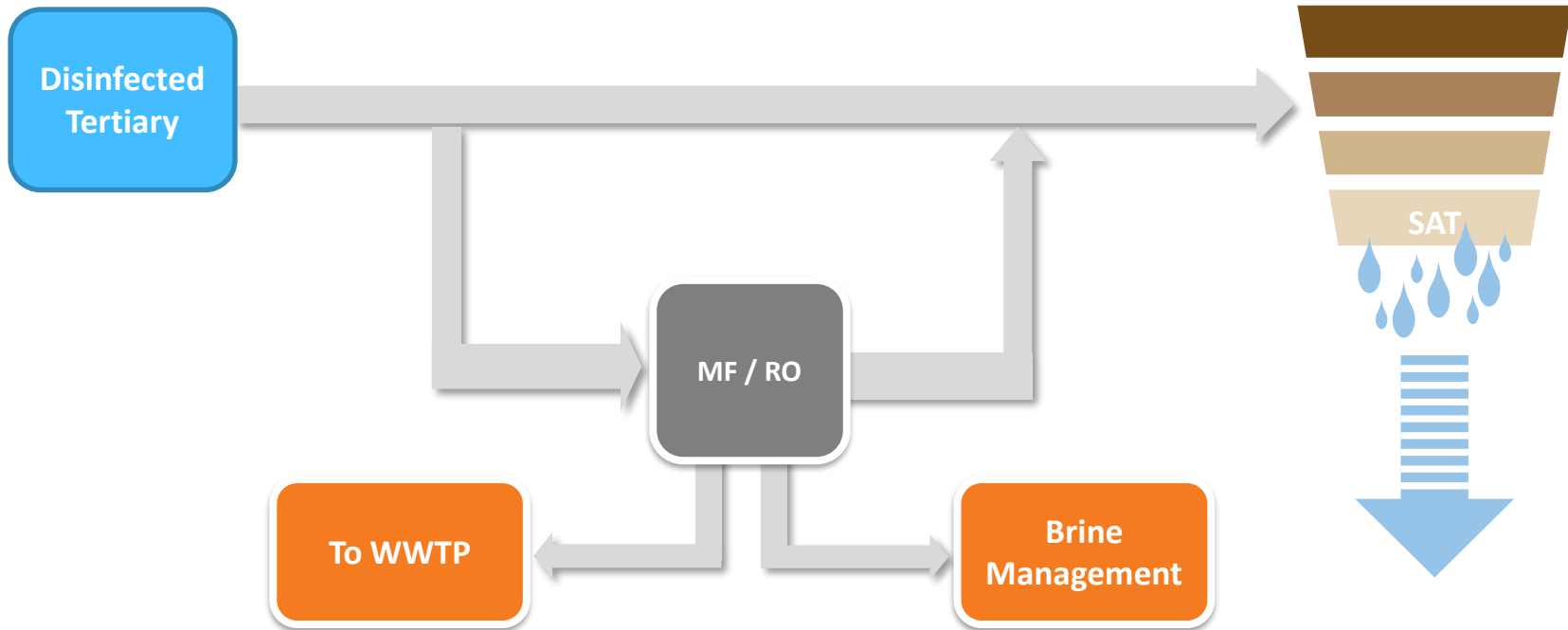


Groundwater Reliability Plus

- Group of projects to improve the quality and quantity of water in local groundwater basins
 - Water Banking
 - Purified Water Replenishment



Purified Water Replenishment Simplified Process Flow Diagram



Blend of Tertiary Recycled Water and Reverse Osmosis Permeate

Potable Reuse Capacity Goals

	Phase I	Phase II
Total Recharge Capacity, AFY	4,000	15,000
Tertiary RW Contribution, AFY	2,000	7,500
RO Permeate Contribution, AFY	2,000	7,500

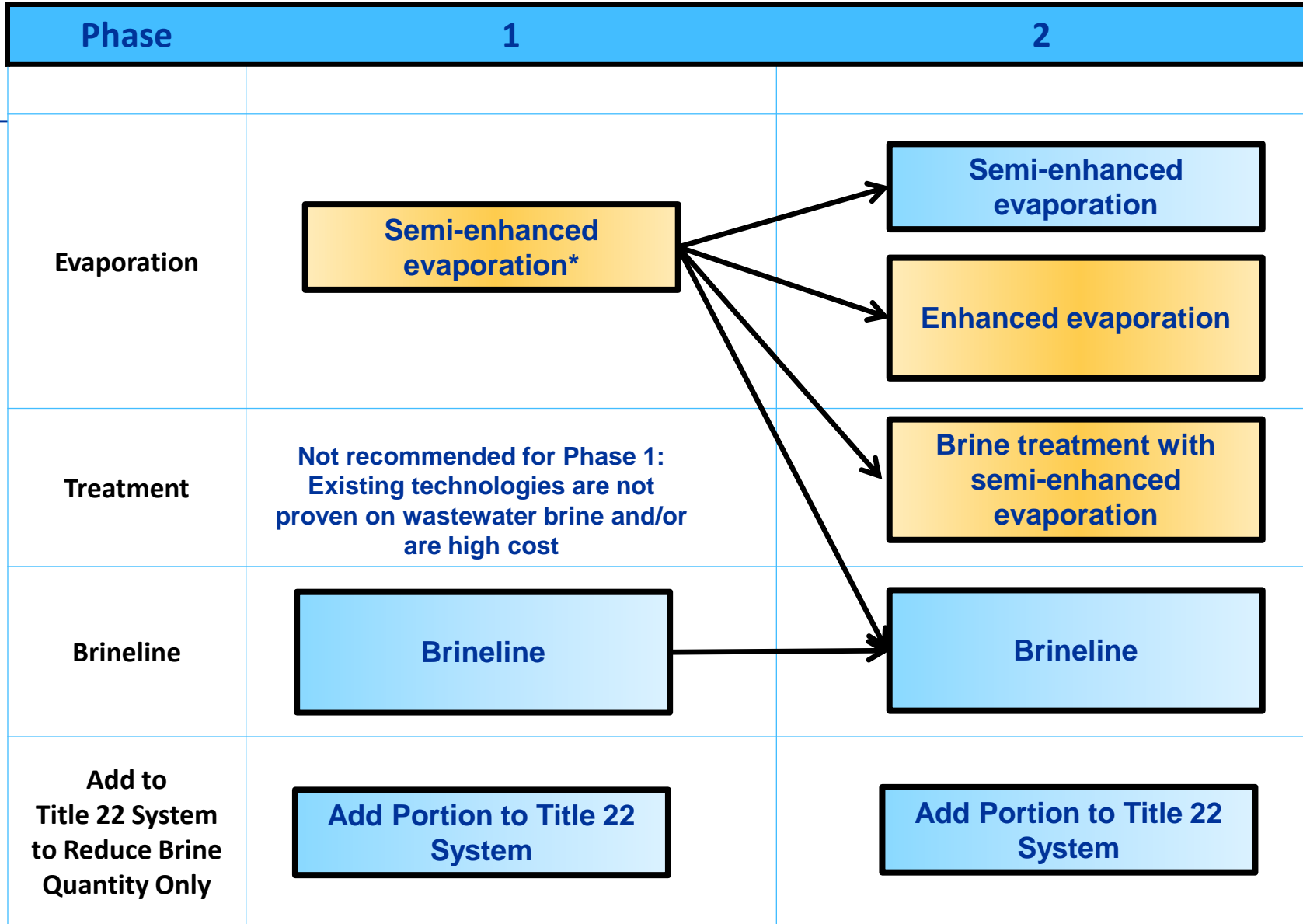
Brine Management Alternatives

No.	Alternatives	No.	Alternatives
1	IEBL Connection	9	Closed Circuit Desal
2	Utilize Sewer	10	High Silica Operation RO
3	Evaporation Ponds	11	HERO™
4	Enhanced Evaporation	12	OPUS™
5	Wind Aided Evaporation	13	V-SEP
6	High Recovery RO	14	Zero Liquid Discharge
7	Lime Enhanced High Recovery	15	Deep Well Injection
8	Zero Discharge Desalination		

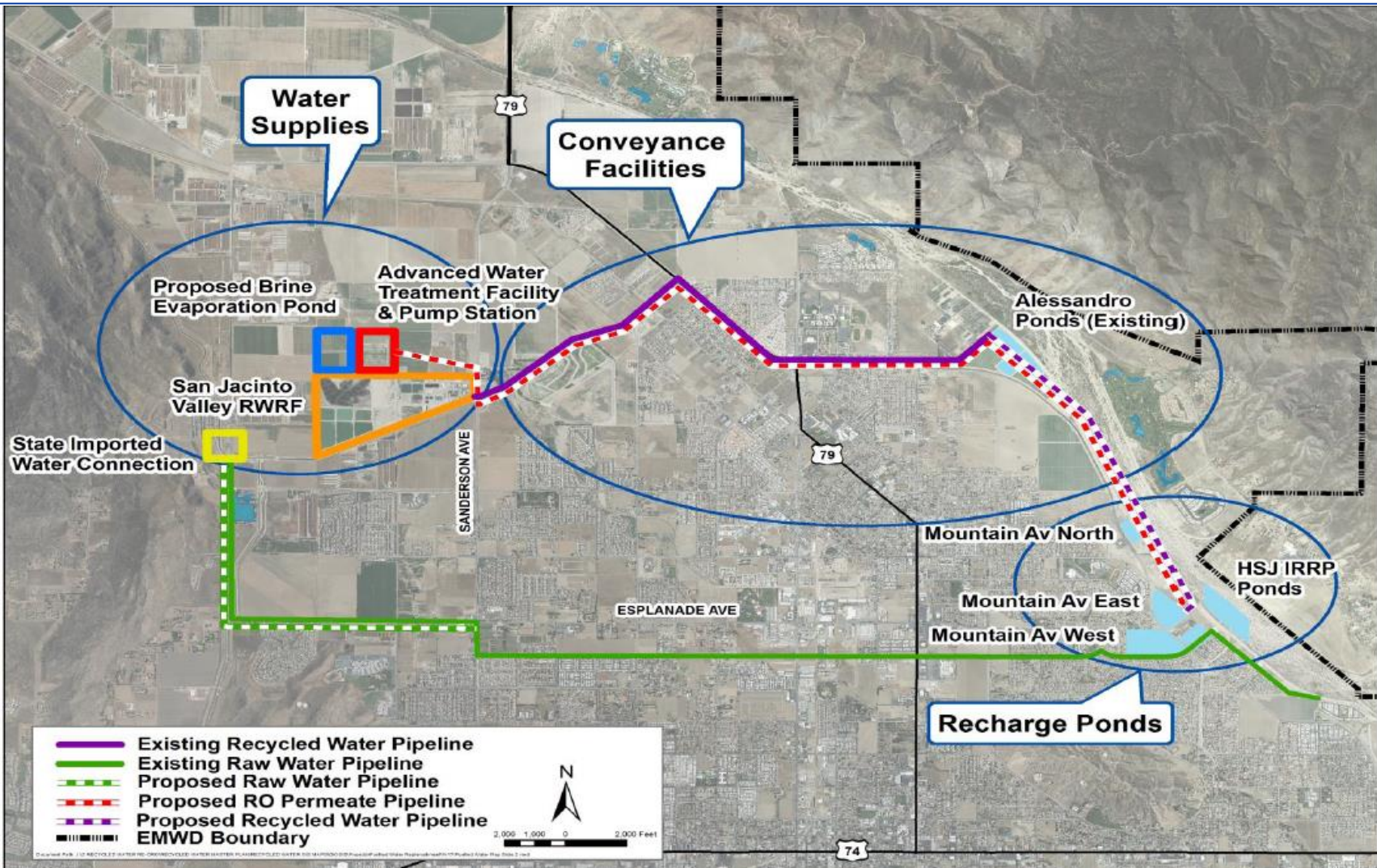
Evaluation Criteria and Definitions

EVALUATION CRITERIA	DEFINED
Proprietary	Is the alternative a proprietary technology?
Proven at Application	Has alternative applied to brine minimization or disposal in reuse applications
Effective Solution	How effectively does the alternative solve the minimization and/or brine disposal issue?
Regulatory Ease	Is the alternative easy to permit and does it have regulatory impact or environmental impact challenges?
Maintenance Ease	Is the technology easily maintained?
Aesthetic Qualities	Does the alternative have visual, odor, neighbor impacts?
Recovers Water	Does the alternative recover water for use?
Residual Waste Cost	Does the alternative create a byproduct (such as solids) with another disposal issue?
Capital Costs	Does the alternative have a high or low capital cost?
O&M Costs	Does the alternative have a high or low operating and maintenance cost?
Others:	What other criteria need to be considered?

Brine Assumptions



Purified Water Replenishment Facilities

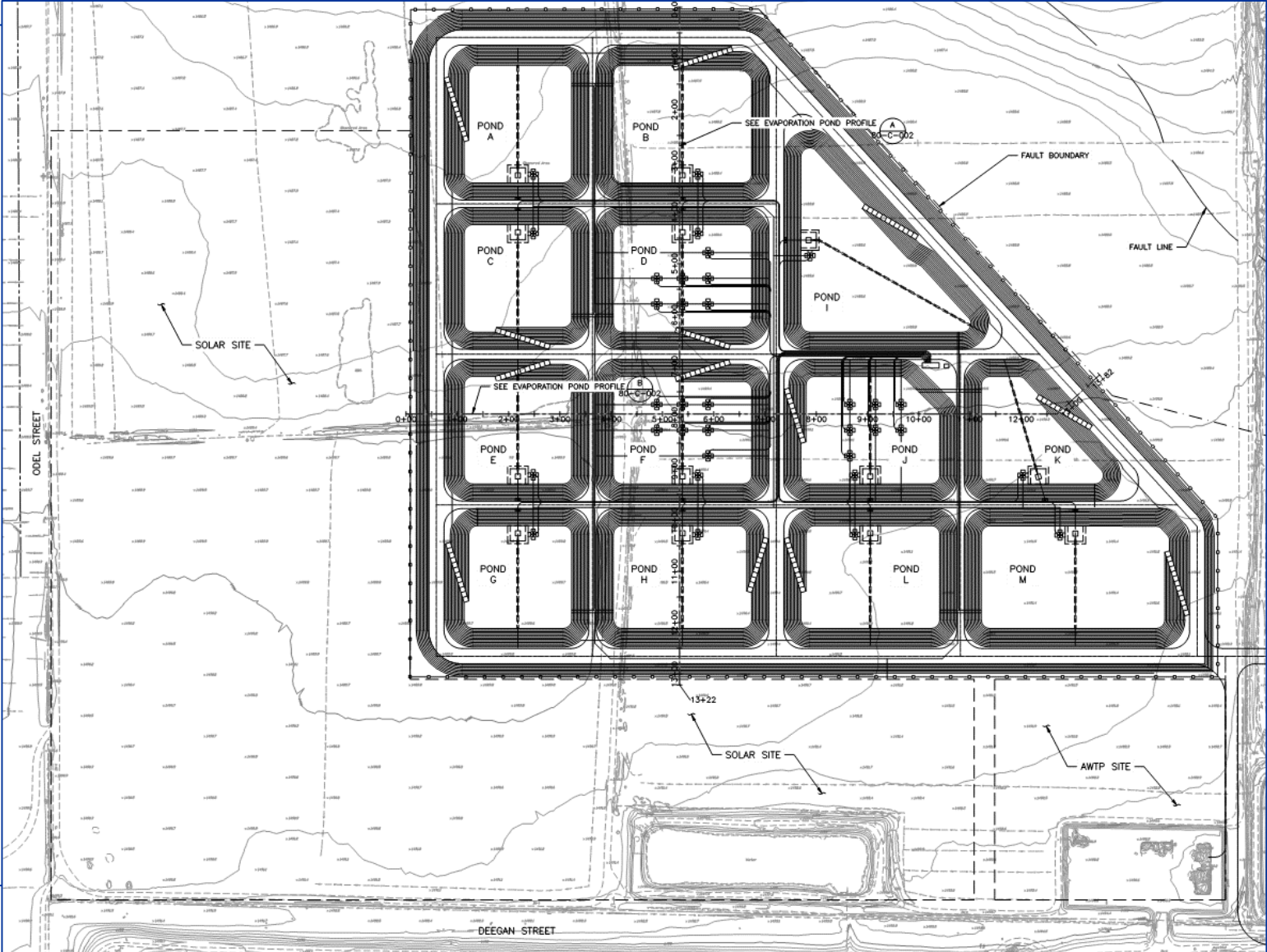


Project Design Flows – Phase I

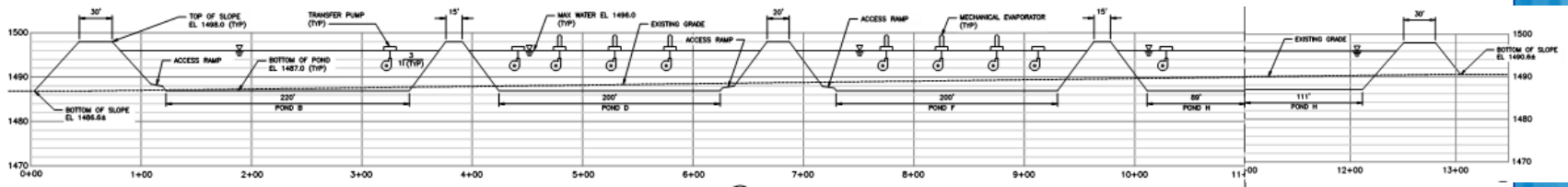
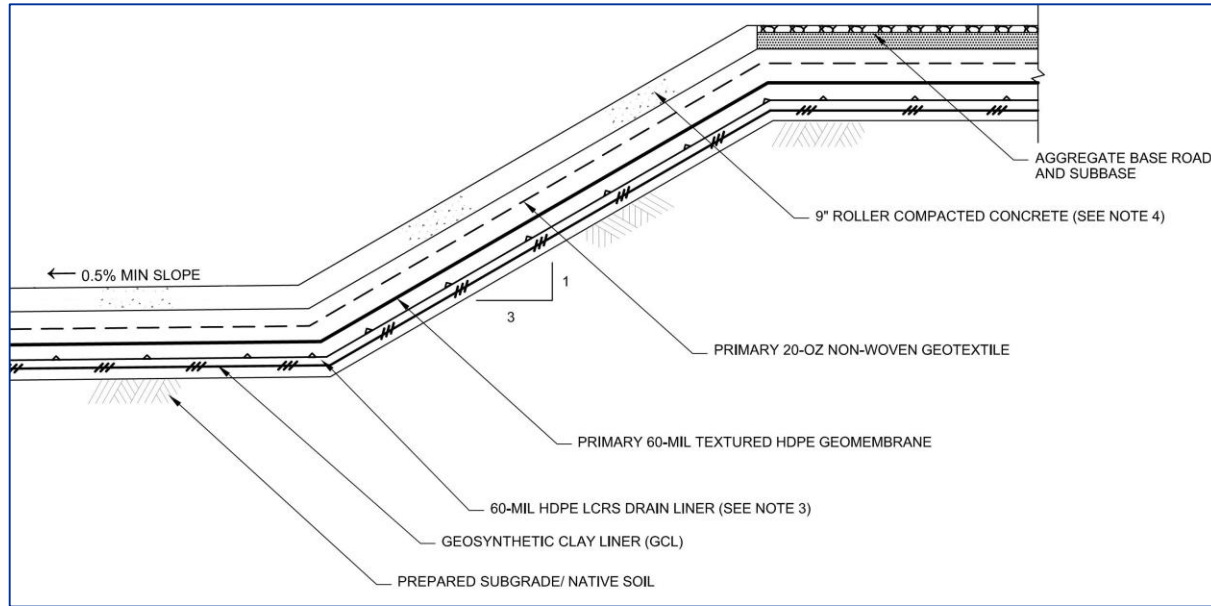
- Recoveries
 - MF Recovery 94%
 - Primary RO Recovery 85%
 - Secondary RO Recovery 52%
 - Overall RO Recover 92.8%
- AWPf Feed = 2.3 MGD
- Primary RO Feed = 2.2 MGD
- Secondary RO Feed = 0.32 MGD
- AWPf Product = 2.0 MGD
- Secondary RO Concentrate = 0.16 MGD to (brine ponds)



Brine Evaporation Pond - Layout

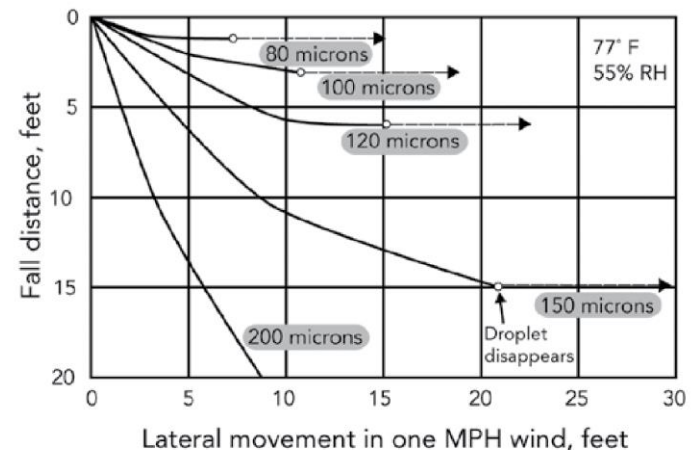
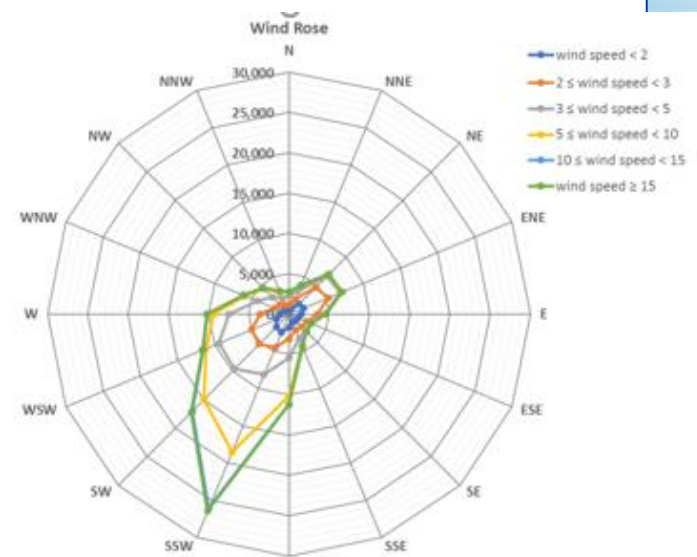


Brine Evaporation Pond - Typical Sections

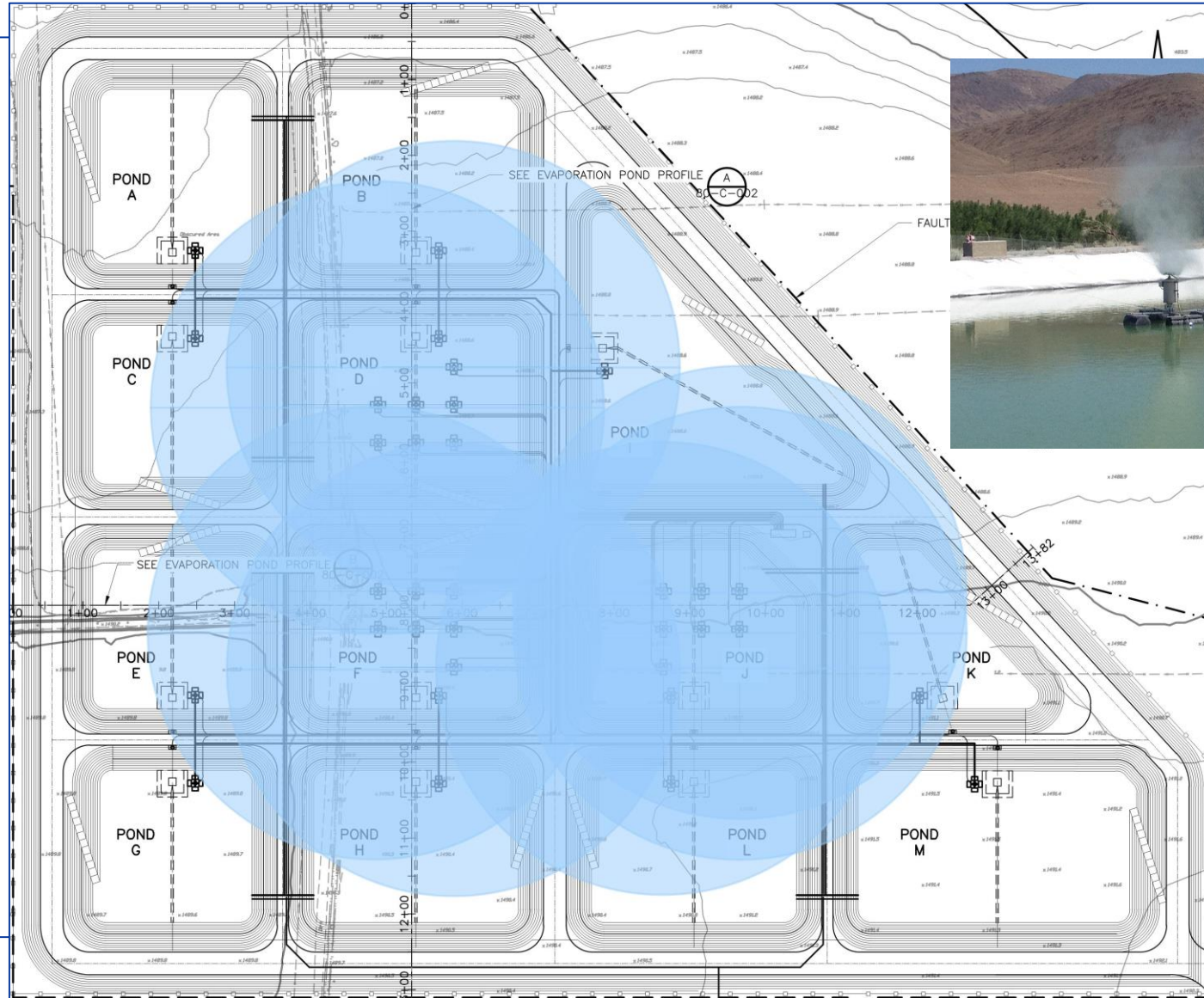


Regulatory Compliance Brine Evaporation Ponds

- Climatology
 - Precipitation data
 - Evaporation rates
 - Wind direction/speed data
 - Land Use
- Waste Streams
 - Influent flows
 - Waste Classification/WQ
- Evaporation Model
 - Natural evaporation, TDS, drift
 - 150 micron/15 mph/315 feet
- Avg. evaporation area – 20 ac
- 13 cells – 1.13 ac to 2.07 ac
- Spray evaporators – 18 (plus 3)
- Pond fill/transfer criteria



Regulatory Compliance Brine Evaporation Ponds



Regulatory Compliance Brine Evaporation Ponds

- Detection Monitoring Systems
 - Leachate Collection and Removal System (LCRS)
 - Action Leakage Rates (ALRs)
 - Rapid and Large Leakage Rate (RLLRs)
 - Vadose Zone Monitoring System
 - GW Detection Monitoring System w/ trigger points
- Monitoring Programs
 - Detection, Evaluation, Correction Action
- Closure Post-Closure Maintenance

Acknowledgements



The Membrane Technology Consultants™