Achieving Sustainability and Resiliency through Water Reuse

Vijay Sundaram, PE
Water Reuse Technology Leader

NEWEA Conference
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Agenda

1. Water Reuse Project Drivers
2. Integrated Water Planning
3. Case Study #1 – Groundwater Recharge
4. Case Study #2 - Minimization of Evaporation Loss
5. Summary

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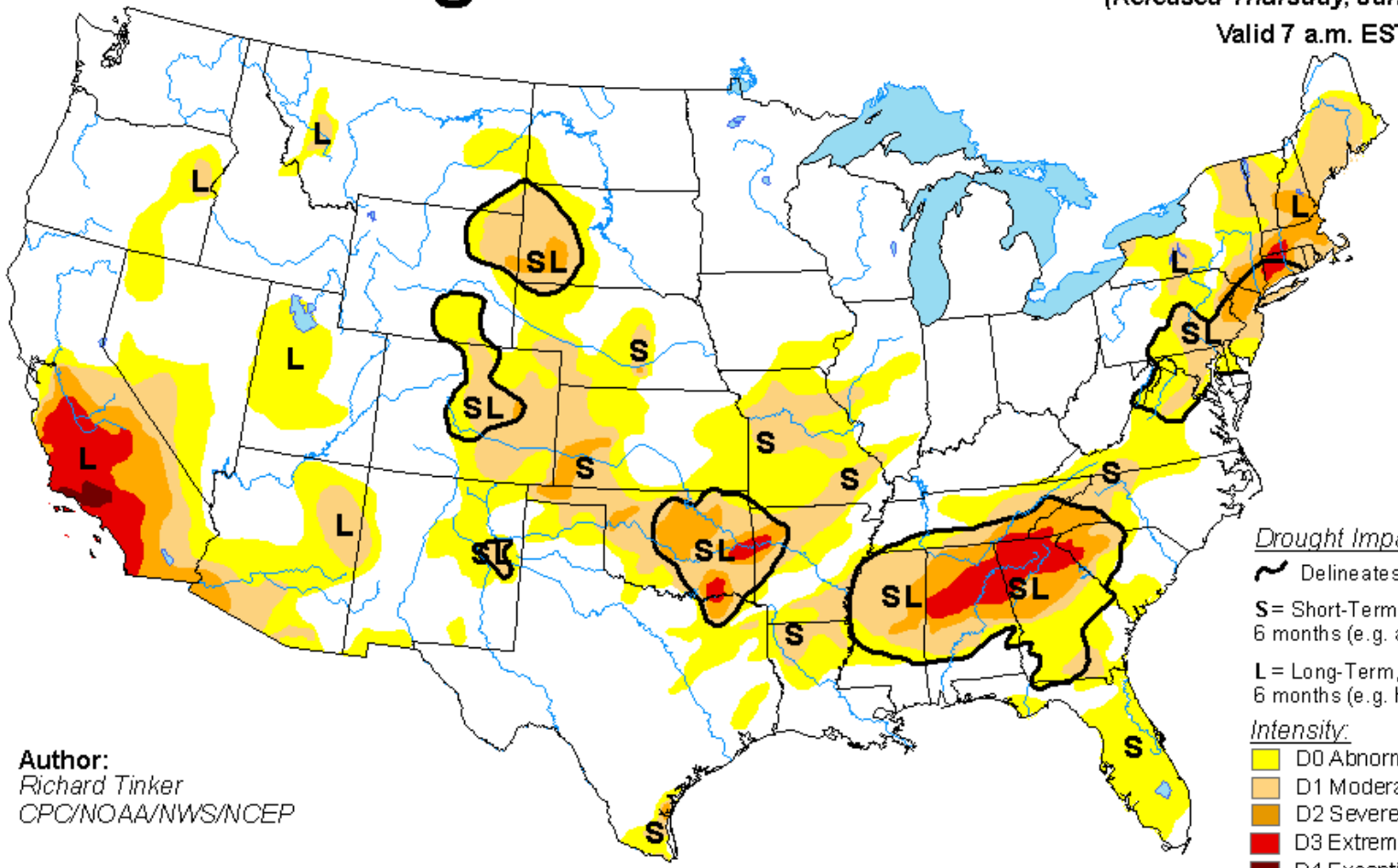
U.S. Drought Monitor

January 17, 2017

(Released Thursday, Jan. 19, 2017)

Valid 7 a.m. EST



Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

Drought Impact Types:

Delineates dominant impacts

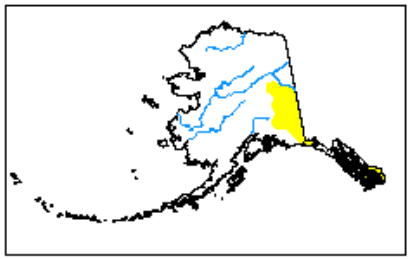
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

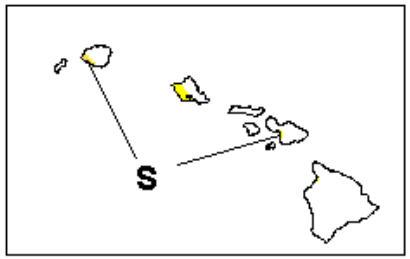
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

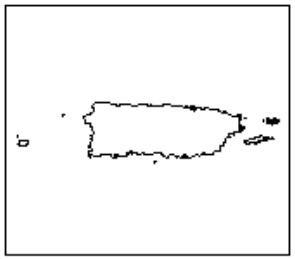
Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.







USDA

National Drought Mitigation Center

http://droughtmonitor.unl.edu/

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Number of water supply sources available to California towns/cities that experienced extreme water shortages during summer of 2015.

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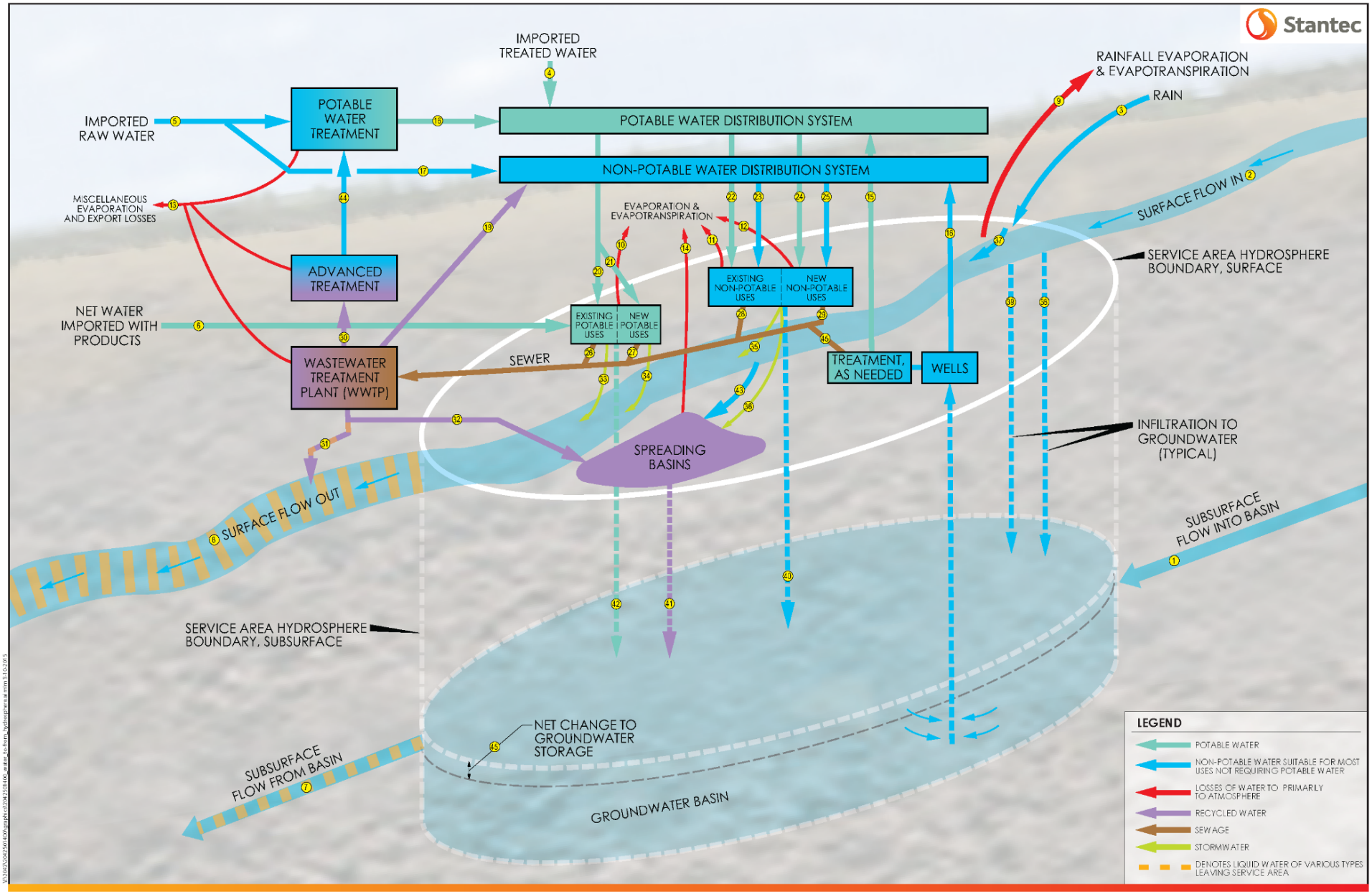
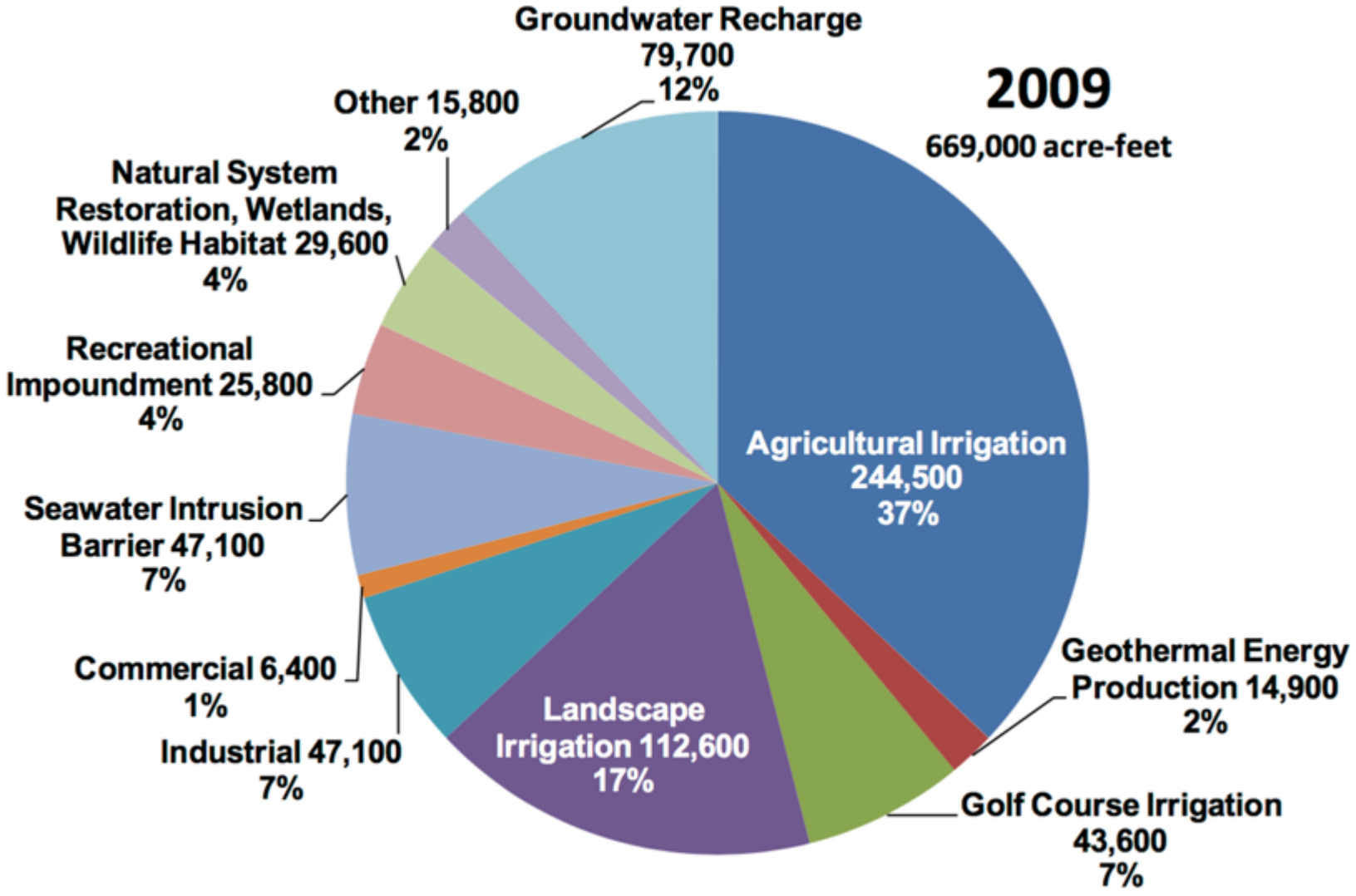
Rural Inland Communities are Relatively More Vulnerable

- Water portfolio is less diversified
- Smaller labor pool
- Typically lower median household incomes
- Case in point: East Porterville CA, Okieville CA, Williams, AZ, Cloudcroft, NM

Integrated Water Planning



Types of Water Reuse



Uses of recycled water in Calif. (SWRCB 2011)

Recycled Water Delivery Options

Dual Pipe Systems (e.g., Landscape Irrigation)

Benefits

- CECs are of Lesser Concern
- Wide Public Acceptance

Potential Issues and Concerns

- Expensive additional infrastructure
- Cross Connection Issues
- Winter Effluent Management/Disposal is Still Required

Single Pipe Systems (e.g., Groundwater Recharge)

Benefits

- A potential solution to local groundwater over-drafting problems
- Provides drought proof, reliable water supply

Potential Issues and Concerns

- Chemicals of Emerging Concern (CECs)
- Regulatory and public perception challenges

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Recycled Water Storage Options

Surface Storage (e.g., Aboveground Reservoir Storage)

Benefits

- Regulatory concerns are less

Potential Issues and Concerns

- Loss of water resource by evaporation
- Algal Growth: Taste & Odor

Subsurface Storage (e.g., Groundwater Recharge Operations)

Benefits

- No evaporation loss
- No algae/wildlife degradation

Potential Issues and Concerns

- Adverse impacts to other beneficial uses
- Leaching of subsurface soil constituents
- Operation and maintenance (well clogging)

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Recycled Water Treatment Options

	Salt	CECs	Pathogens
Landscape Irrigation	Site-specific concerns	No concerns at this time	Primary concern
Groundwater Recharge	Site-specific concerns	Primary concern	Primary concern
Recommended Treatment Options	Reverse Osmosis (RO). To the extent required to meet WQO.	• Soil Aquifer Treatment (SAT) • RO • Ozone-BAC	• UV • Ozone • Chlorine

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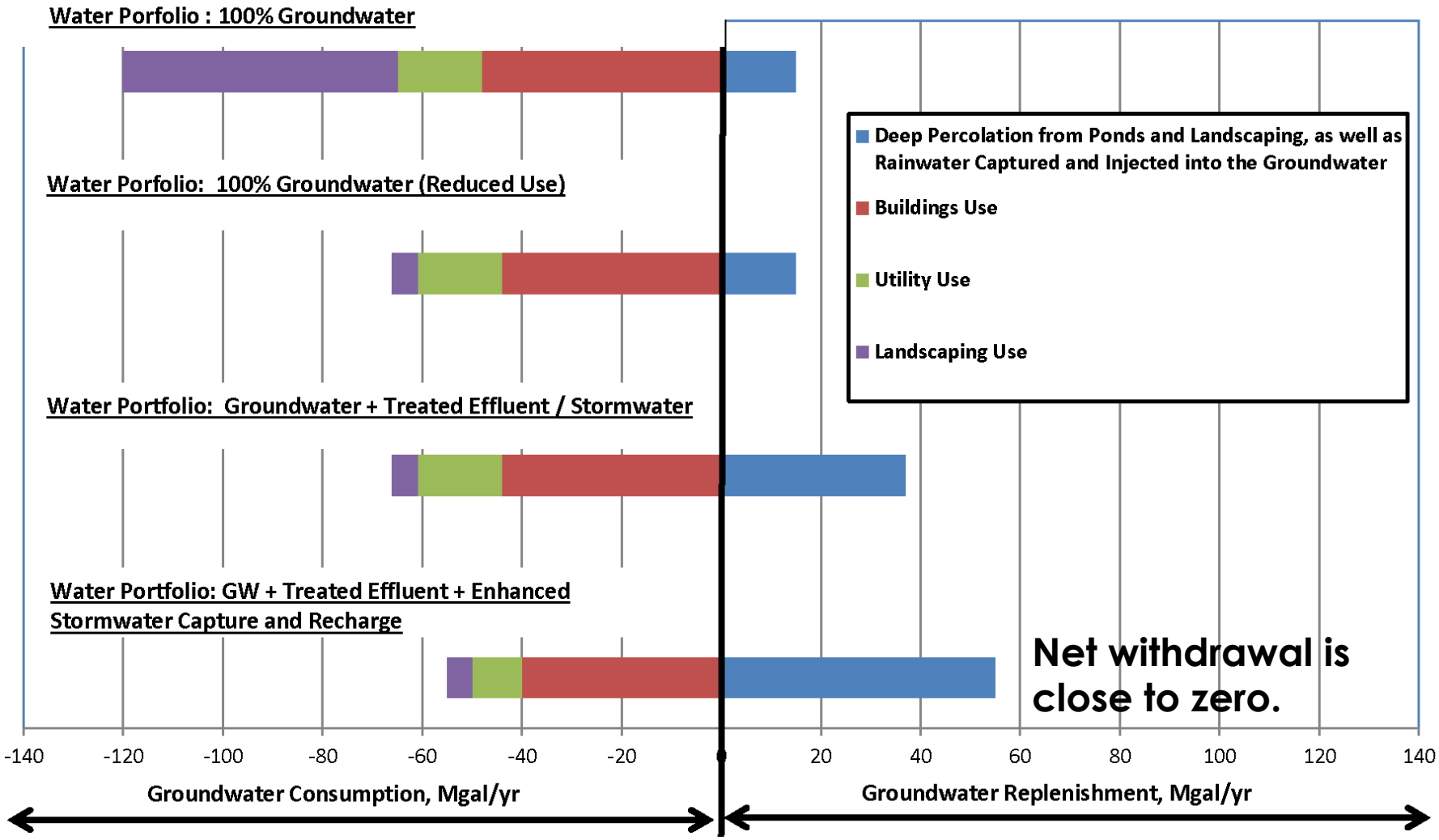
Journey to Water Neutrality

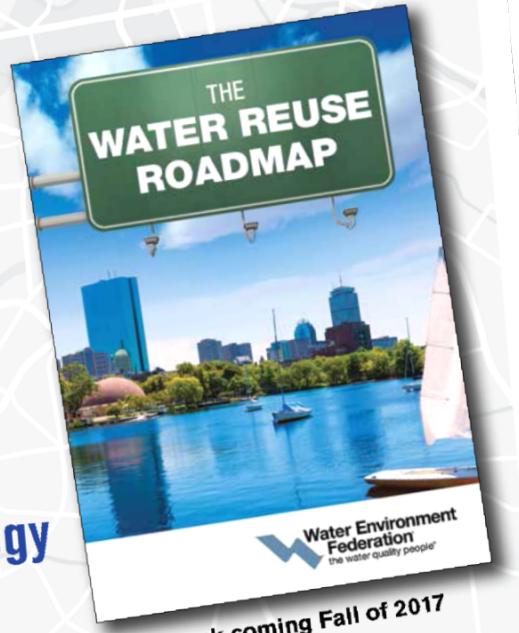


Which Water Management Strategy is Best Suited for Your Community?

The Water Reuse Roadmap

P R I M E R

Essential practices to make water reuse an element of a diverse and resilient water management strategy



Book coming Fall of 2017

Case Study #1
Groundwater Recharge

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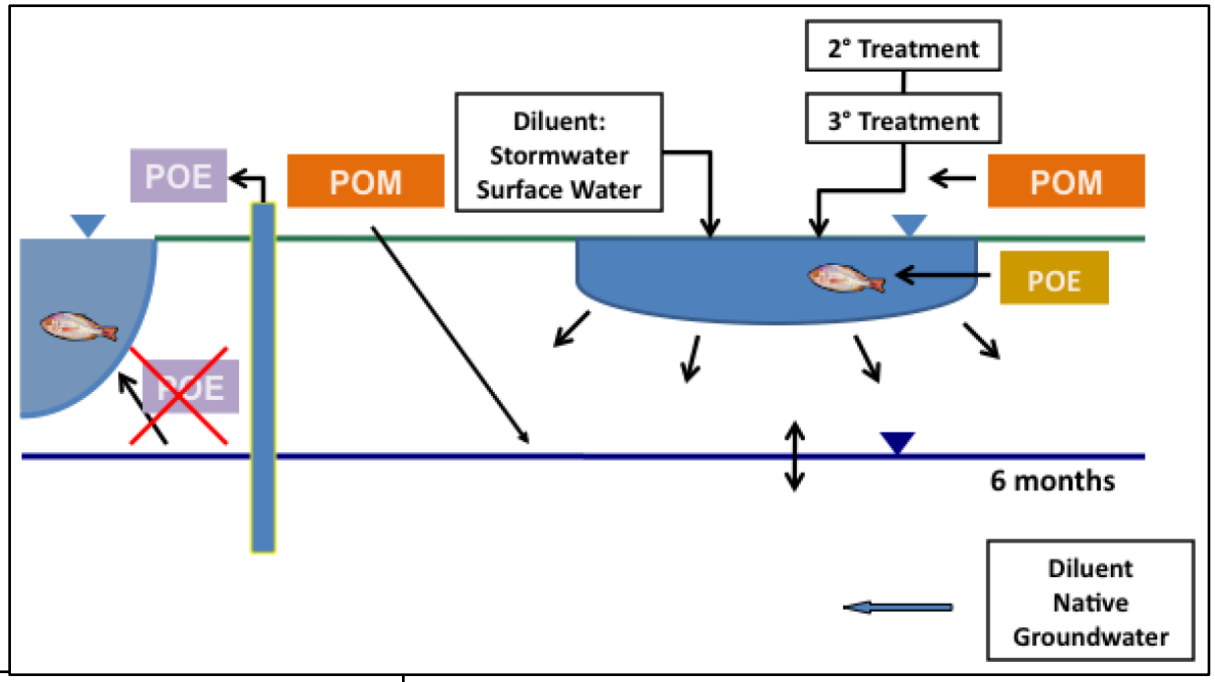
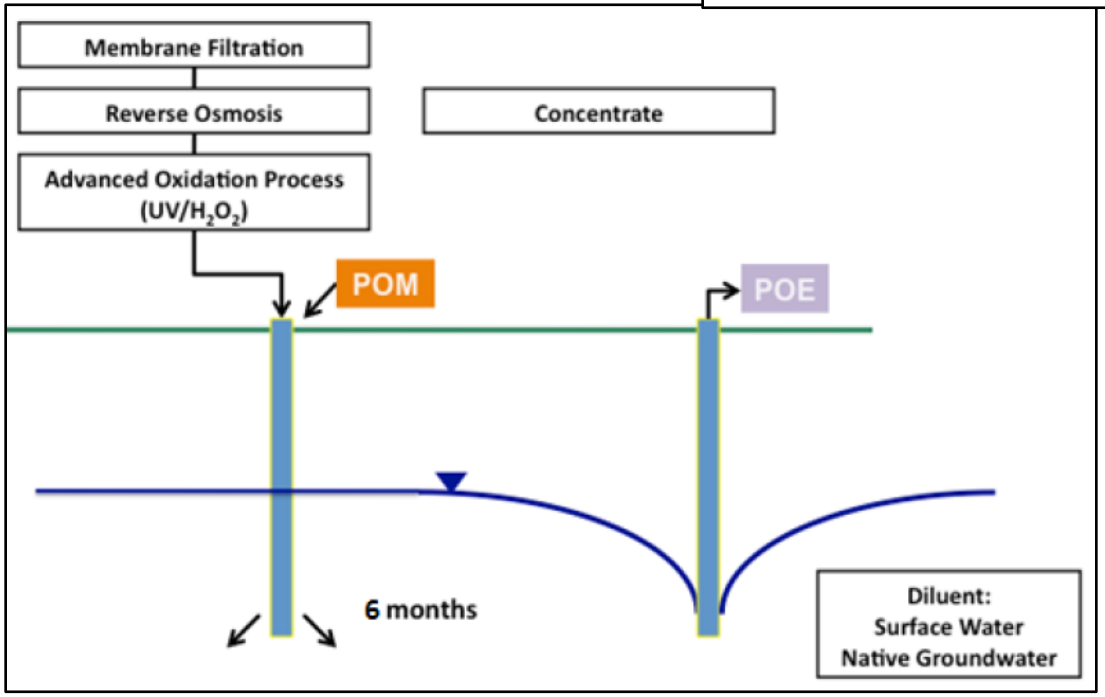
Groundwater Recharge Conceptual Models

Spreading Operations



Injection Operations



POM – Point of Monitoring
POE – Point of Exposure

Adopted from California DDW CEC Panel Report, 2010.

Orange County Water District (OCWD) Recharge/Spreading Basin Projects

Miraloma Effluent Recharge Basin

- 30,000 ac-ft/year capacity
- Highest percolation rate (10 ft/d) of OCWD's 21 basins

La Palma Effluent Recharge Basin

- 50,000 ac-ft/year capacity
- Architectural landscaping includes native trees and shrubs to enhance the site's appearance.
- Went online in August 2016

Miraloma Recharge Basin in Operation.

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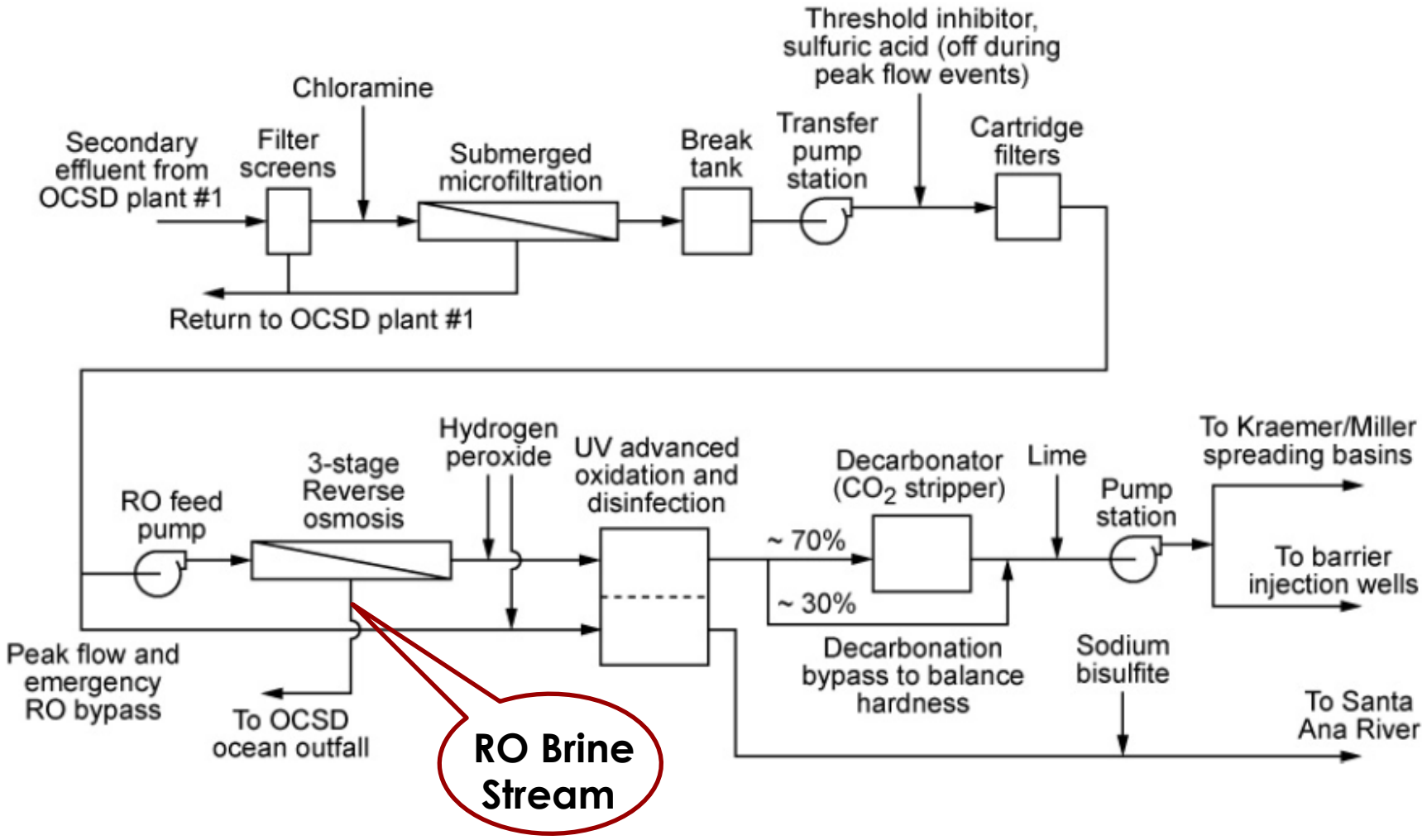
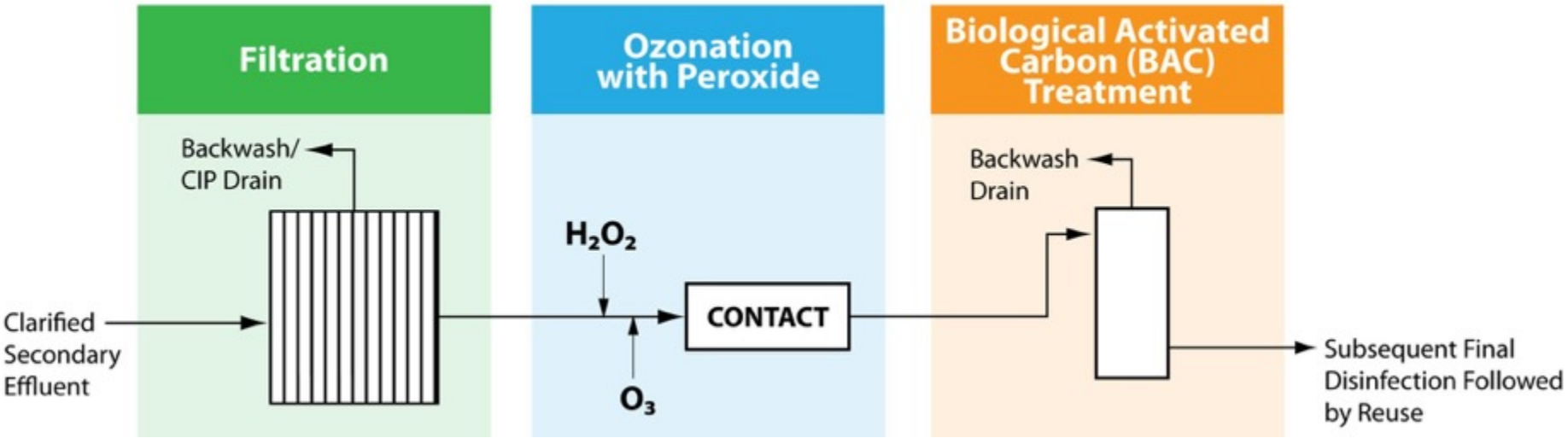
Orange County Groundwater Replenishment System Advanced Water Treatment Facility (RO based AWTF)



Adapted from OCWD

Ozone-BAC: Alternative to RO AWTF



- Most refractory organics destroyed, not concentrated in brine stream
- No brine stream generated needing treatment and/or disposal
- Lower capital cost
- Lower energy utilization and O&M cost

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Comparison of Treatment Trains

Category	RO AWTF	Ozone-BAC AWTF
Refractory Organics (e.g., CECs)	Concentrated in brine stream	Degraded and/or adsorbed
Reject/Side Streams	Some	None
Total Dissolved Solids (TDS)	Concentrated in brine stream	Unchanged
Corrosivity	Increased	Unchanged
Net TOC Removal	Limit of Technology ≤0.5 mg/L	Function of carbon change out frequency.
Energy, Maintenance, & Capital Cost	Highest on all accounts	Substantial Advantage

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WE&RF 15-10 Research Project

Optimization of Ozone-BAC Treatment Processes for Potable Reuse Applications (2015 – 18)

- Establish relationship between effluent TOC and disinfection byproducts
- Optimization of BAC to achieve maximum NDMA and CEC removal
- Guidance manual on operational optimization of Ozone-BAC

AMERICAN WATER

SEAL OF WASHOE COUNTY STATE OF NEVADA

WATER ENVIRONMENT & REUSE FOUNDATION WE&RF

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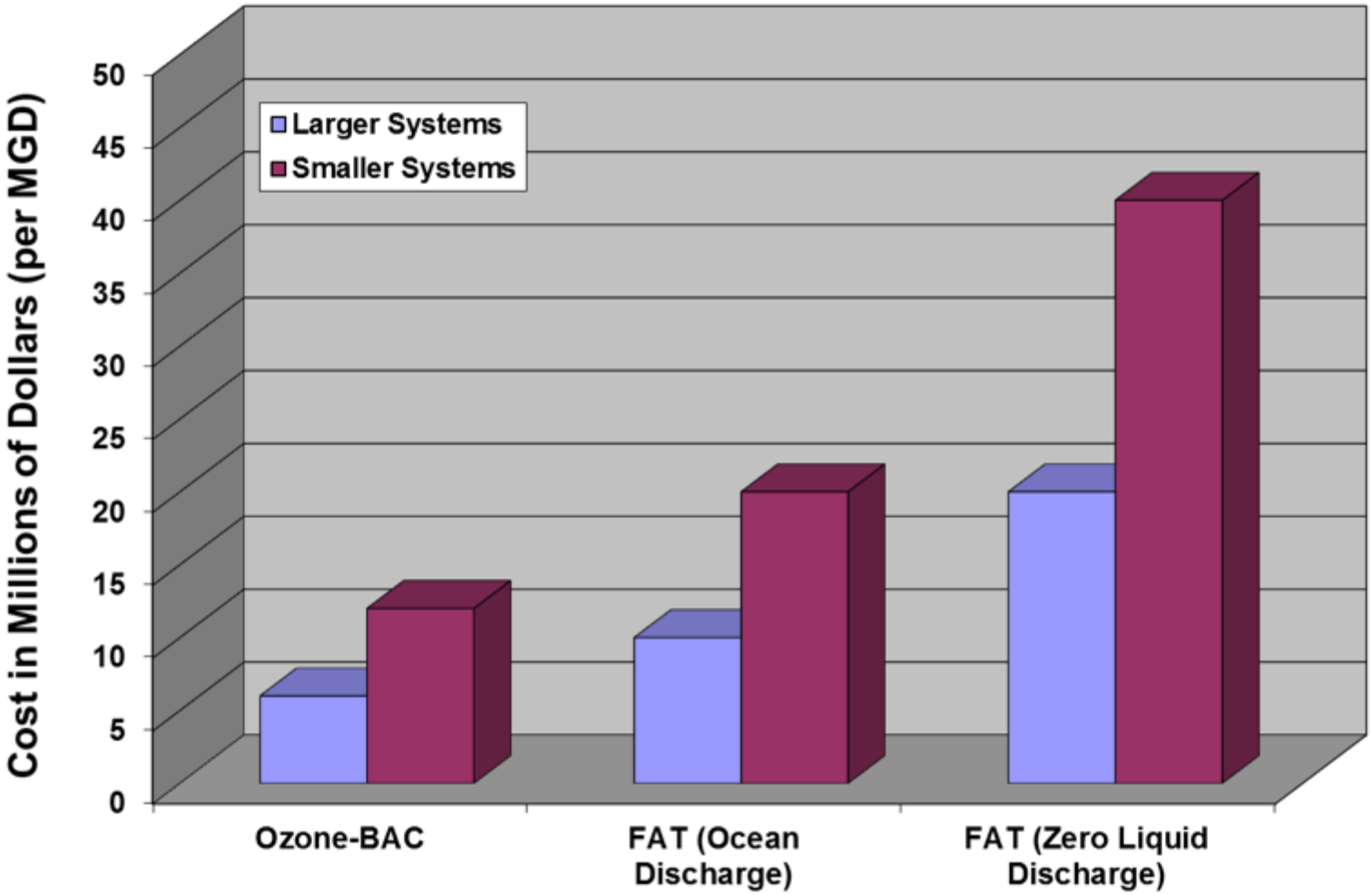
AWTF Capital Cost (per MGD)



Cost per MGD is based on 2011 cost analysis.

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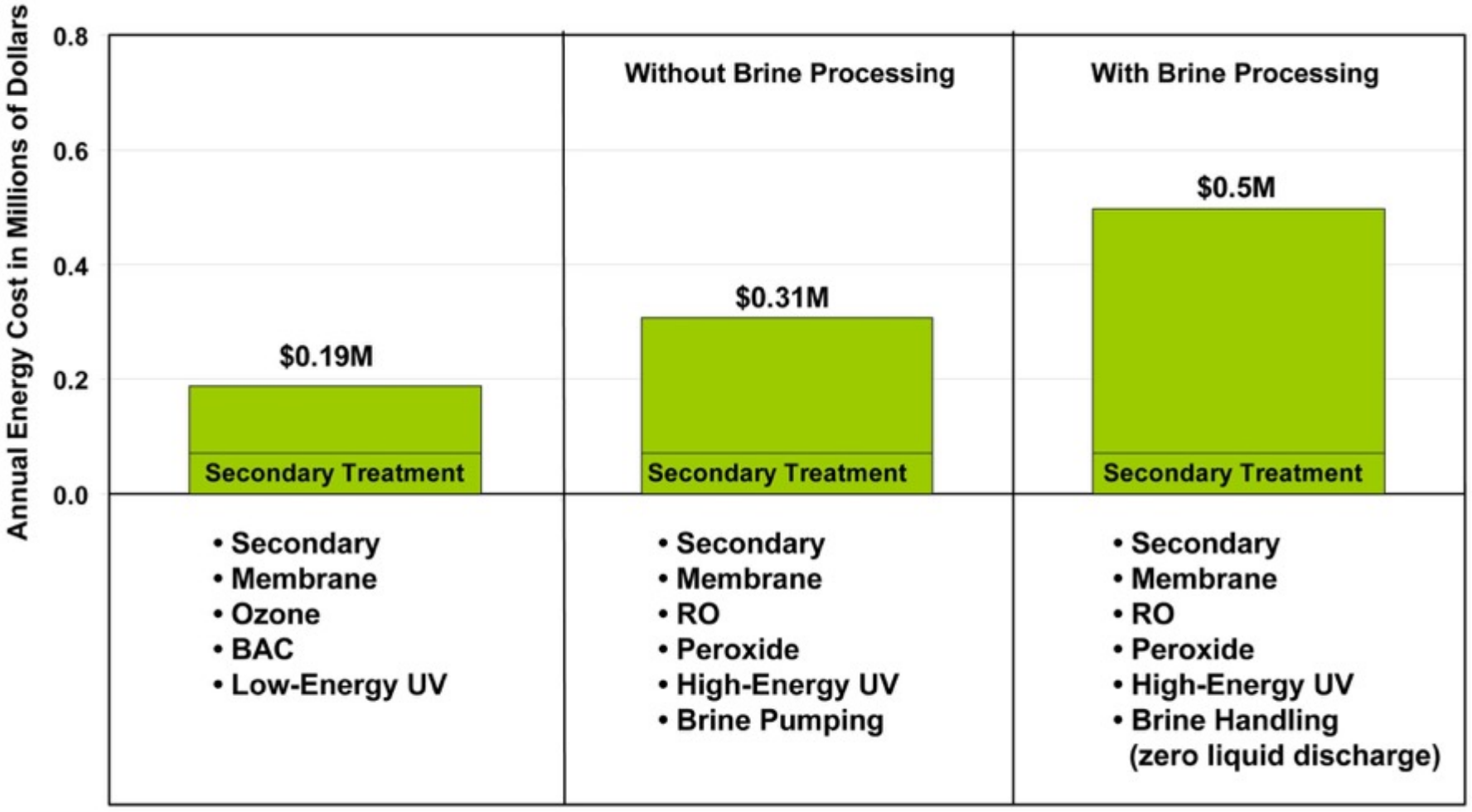
AWTF Energy Usage

Average Flow = 1 Mgal/d & Unit Power Cost = $0.14/kWh



Ozone-BAC AWTF Uses Less Energy than RO AWTF

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Case Study #2
Minimizing Evaporation Losses

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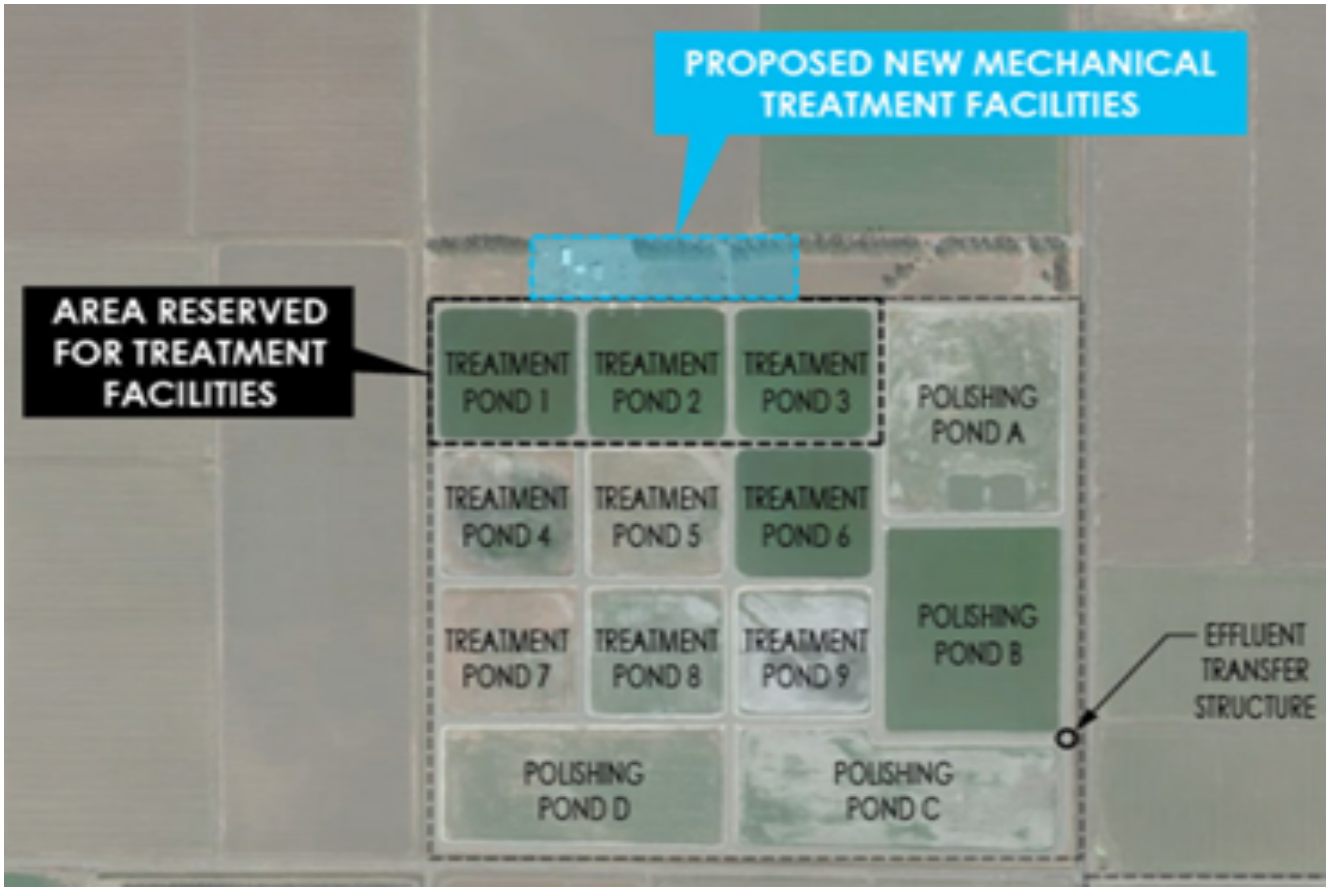
City of Dixon
Water Conservation Project



Reduction in evaporation loss from WWTP process footprint change amounts to 25% of City's potable water demand

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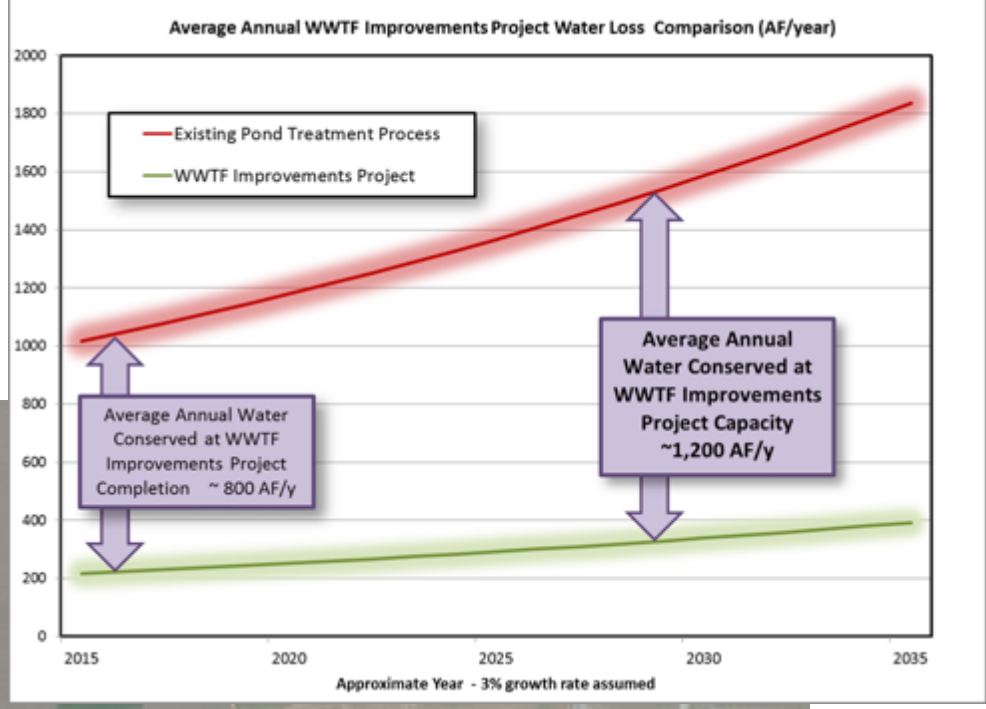
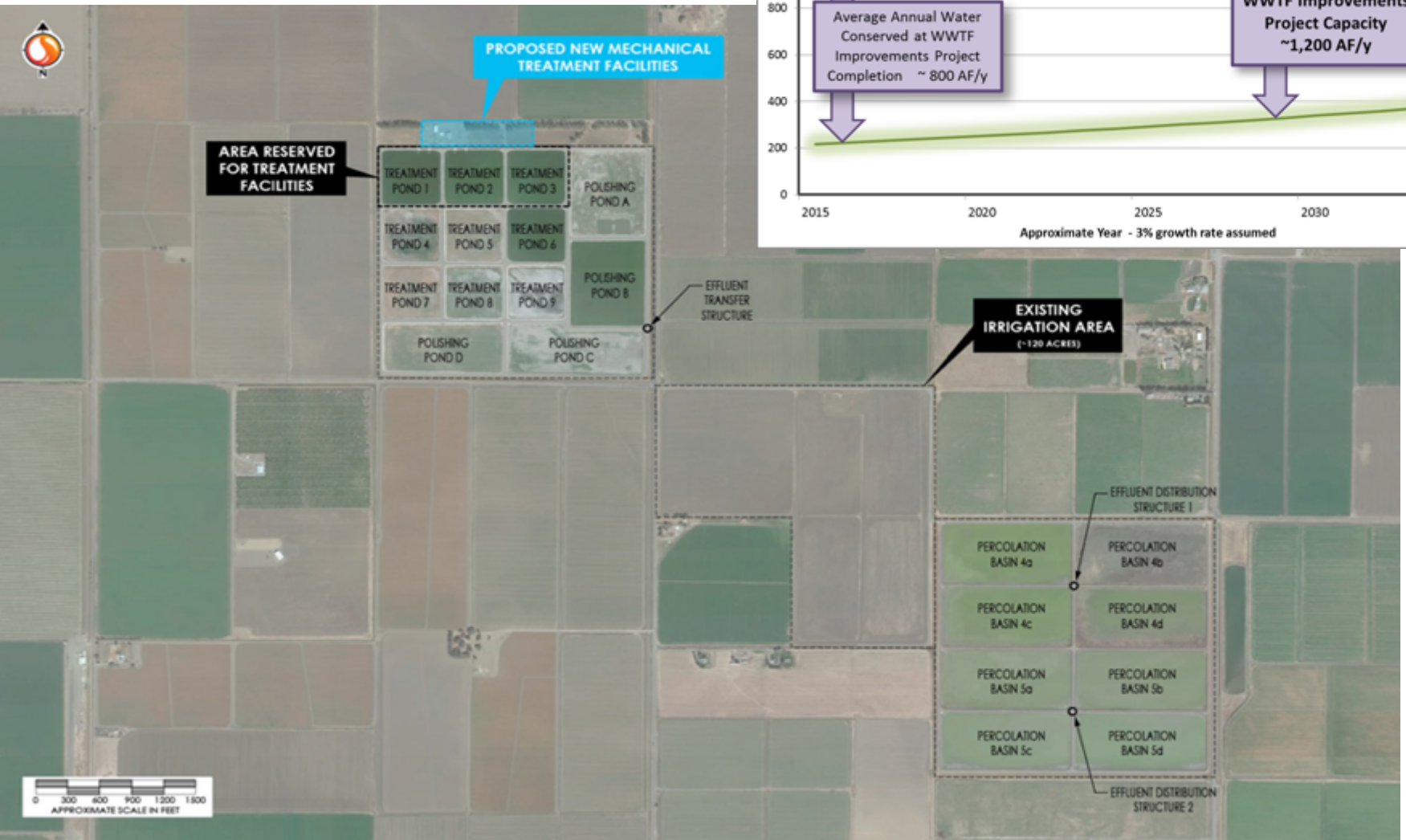
Dixon Water Conservation Project

…a novel approach to water conservation and sustainability





Summary

- A well-diversified water portfolio provides resilience
- Water reuse is one of the tools that can be applied in the integrated resource planning/management
- Groundwater replenishment provides a safety net during drought
- Local factors play key roles in water reuse planning/strategy development

Contact info:
Vijay Sundaram, PE
916-316-0522
Vijay.Sundaram@Stantec.com

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