

DIRECT POTABLE REUSE: A PATH FORWARD:

2012 WATER REUSE CONFERENCE

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Overview of Presentation

- Take Home Message
- Reuse Opportunities
- De Facto and Planned Indirect Potable Reuse
- Proposed Direct Potable Reuse Strategies
- Technologies for Direct Potable Reuse
- What are Others Doing?
- Opportunities for the Future: The Southern California Example

Take Home Message

Ultimately, **direct (and indirect) potable reuse** is inevitable in urban areas and will represent an essential element of sustainable water resources management

Reuse Opportunities

- Agricultural irrigation
- Landscape irrigation
- Industrial uses (site specific)
- Urban non-irrigation uses (e.g., cooling tower water, toilet flushing, etc.)
- Environmental and recreational uses (e.g., water features, stream augmentation, etc.)
- Indirect potable reuse through groundwater recharge or surface water augmentation
- Direct potable reuse

Factors Limiting Nonpotable and Indirect Potable Reuse

Agricultural Irrigation

- Large distance between reclaimed water and agricultural demand
- Need to provide winter storage

Landscape Irrigation

- Dispersed nature of landscape irrigation
- Cost of parallel distribution system

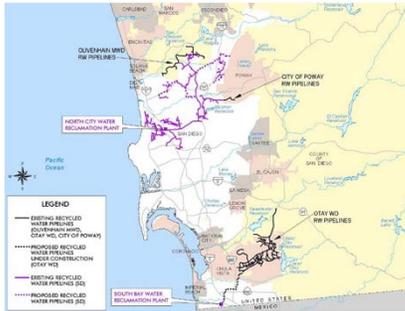
Indirect Potable Reuse

- Most communities lack suitable hydrology for groundwater recharge
- Availability of nearby suitable surface storage

Impact of Urbanization on Plant Siting

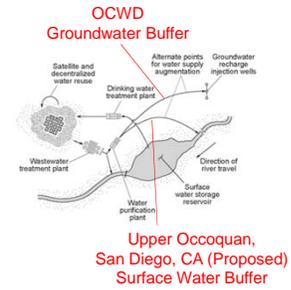


**Infrastructure Requirements Limit Reuse
(Purple pipe may be a bad investment)**



Courtesy City of San Diego

**Planned Indirect Potable Reuse
(Environmental Buffer Required)**



Barrier Injection Wells



Kraemer/Miller Spreading Basins, OCWD

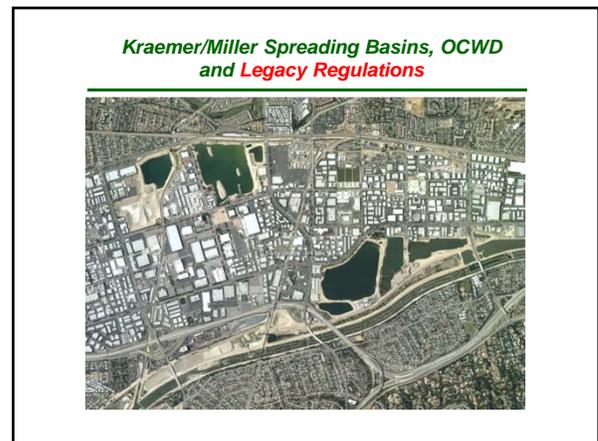
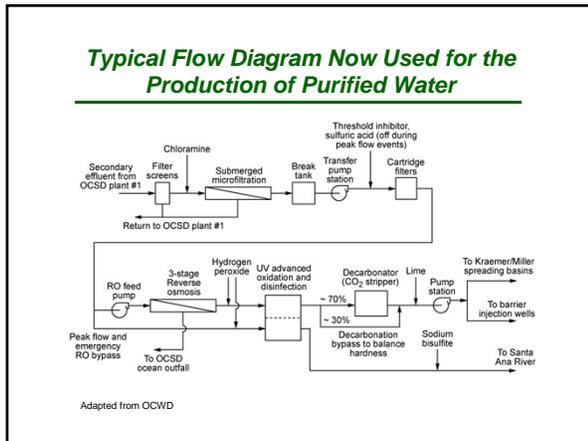
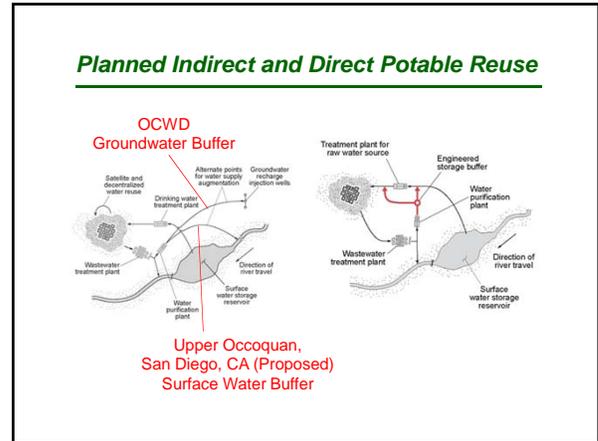
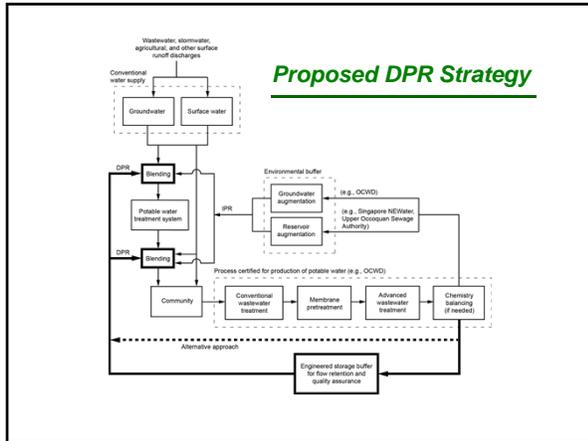


San Vicente Reservoir, San Diego County

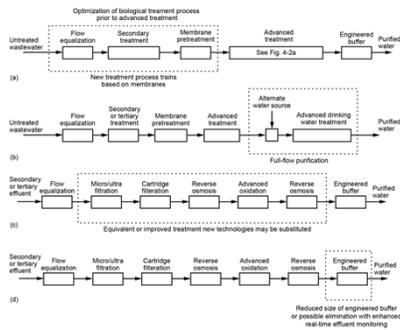


San Vicente Reservoir, San Diego County





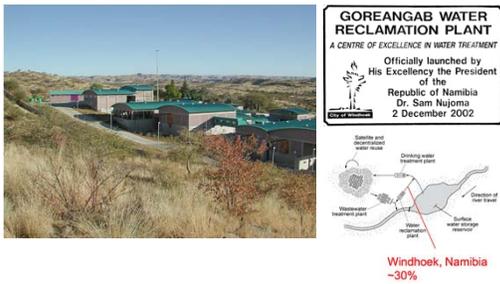
Potential DPR Flow Diagrams



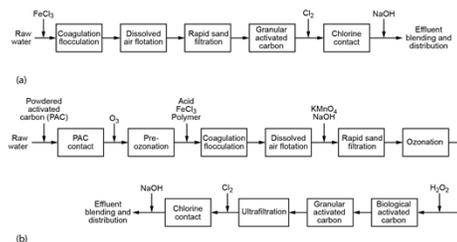
What are Others Doing?

- Windhoek, Namibia
- Pure Cycle Corporation
- Cloudcroft, New Mexico
- Big Springs, Texas

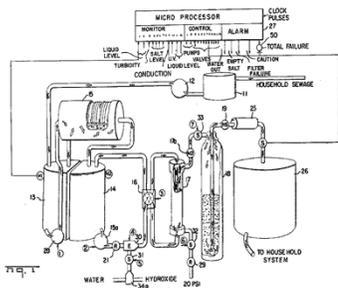
Direct Potable Reuse in Windhoek, Namibia



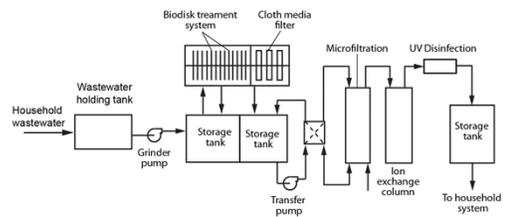
Treatment Process Flow Diagram Windhoek, Namibia



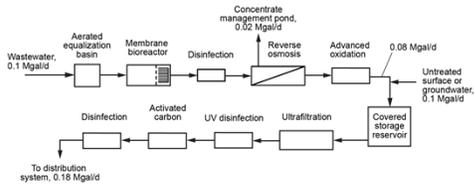
Treatment Process Flow Diagram Pure Cycle Corporation (c.a. late 1970s)



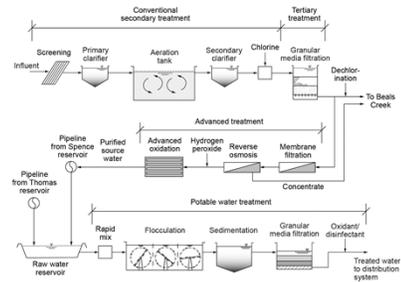
Treatment Process Flow Diagram Pure Cycle Corporation (c.a. late 1970s)



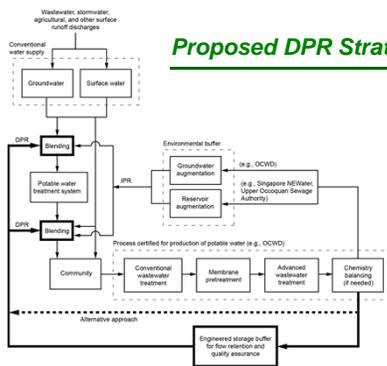
Treatment Process Flow Diagram Cloudcroft, NM (c.a. 2011)



Treatment Process Flow Diagram Big Springs, Texas (c.a. 2011)



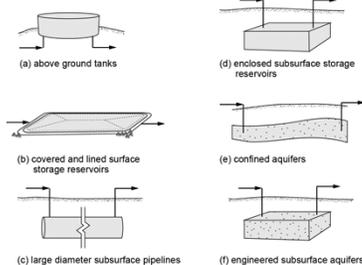
Proposed DPR Strategy



To Protect Public Health

An engineered buffer can be used in place of an environmental buffer with greater control over water quality

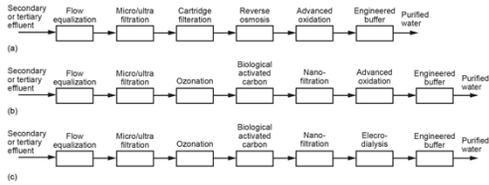
Proven and Conceptual Engineered Buffer Systems



Impact of DPR on Future WWTP Design

- Targeted source control program
- Modification of raw wastewater characteristics
- Elimination of untreated return flows
- Flow equalization
- Operational mode for biological treatment
- Improved design and monitoring
- Ongoing pilot testing
- Alternative advanced treatment process flow diagrams

Alternative DPR Flow Diagrams With and Without Reverse Osmosis With Engineered Buffer



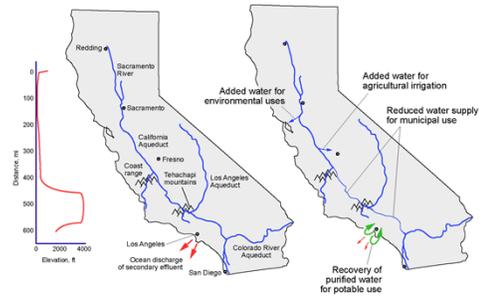
Future Opportunities for DPR: The Southern California Example



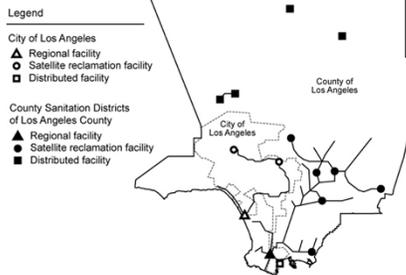
Electric Power Consumption in Typical Urban Water Systems

System	Power consumption, kWh/Mgal	
	Northern California	Southern California
Supply and conveyance	150	8900
Water treatment	100	100
Distribution	1200	1200
Wastewater treatment	2,500	2,500
TOTAL	3,950	12,700

Opportunities for the Future: The Southern California Example



Wastewater Management Infrastructure

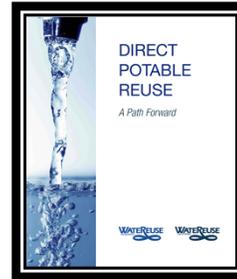


Benefits of the Southern California Example

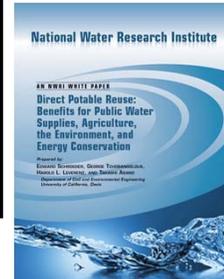
- Reliable alternative source of supply, more secure from natural disasters
- Lower cost and reduced energy usage
- More water available for agricultural use, especially during drought periods
- Environmental benefits for Bay Delta habitat restoration

Research Needs in Direct Potable Reuse

- Sizing of engineered storage buffer
- Treatment train reliability
- Blending requirements
- Enhanced monitoring techniques and methods
- Equivalent advanced treatment trains
- Communication resources for DPR
- Acceptance of direct potable reuse



Some Recent Publications



Closing Thoughts

Ultimately, **direct (and indirect) potable reuse** is inevitable in urban areas and will represent an essential element of sustainable water resources management

- Technology is not an issue
- Must think of wastewater differently
- To make it a reality, bold new planning must begin now!!
- The public is supportive

**THANK YOU
FOR LISTENING**