

***DEVELOPING A DIRECT POTABLE REUSE
FRAMEWORK DOCUMENT FOR THE
WATEREUSE ASSOCIATION***

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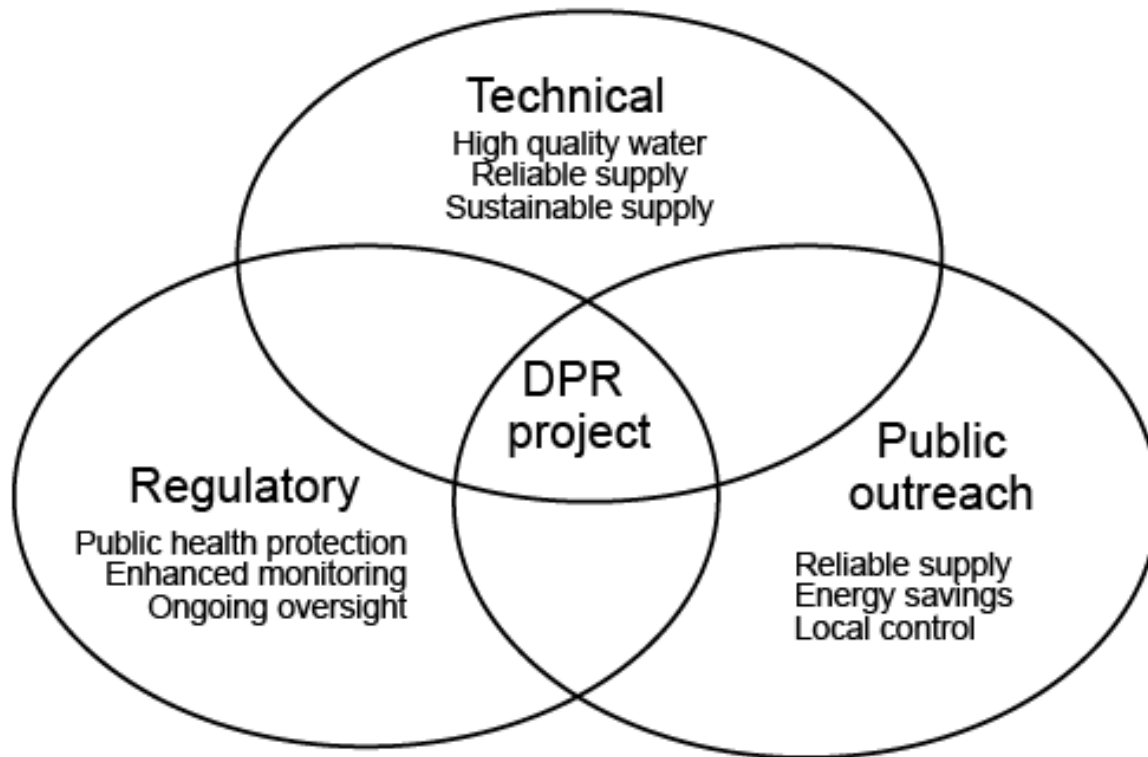
PURPOSE OF FRAMEWORK DOCUMENT

To provide an overview of DPR and to provide a framework for assessing the topics and issues that need to be addressed in the development of future DPR Guidelines.

ORGANIZATION OF DPR FRAMEWORK DOCUMENT

1. Introduction
2. What is Direct Potable Reuse?
3. Key Components of a Successful/Sustainable DPR Program
4. Public Health Protection
5. Source Control Programs
6. Wastewater Treatment
7. Advanced Water Treatment
8. Purified and Finished Water Management
9. Monitoring and Instrumentation Requirements
10. Residuals Management
11. Facility Operation
12. Public Outreach
13. Future Developments

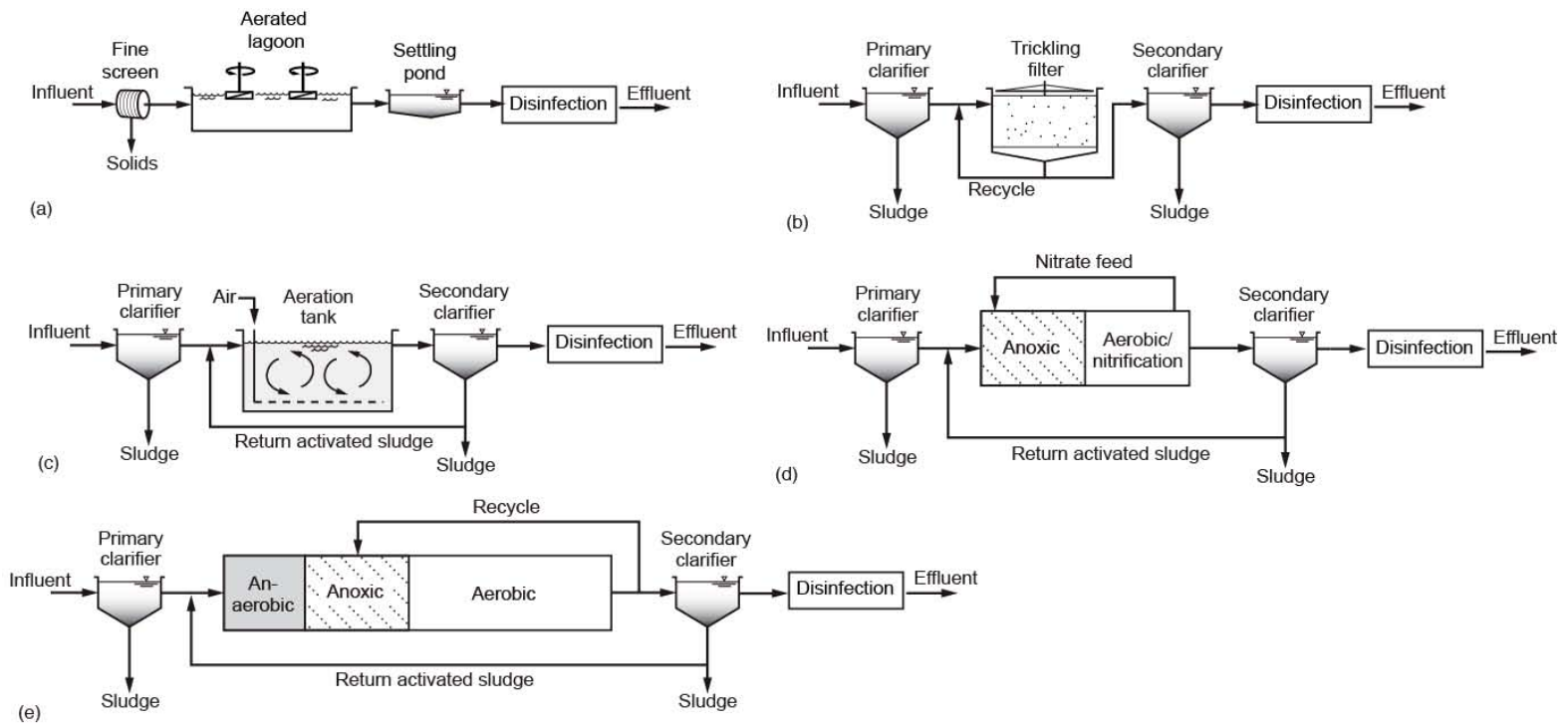
KEY COMPONENTS OF A DPR PROGRAM: TECHNICAL, REGULATORY, AND PUBLIC OUTREACH



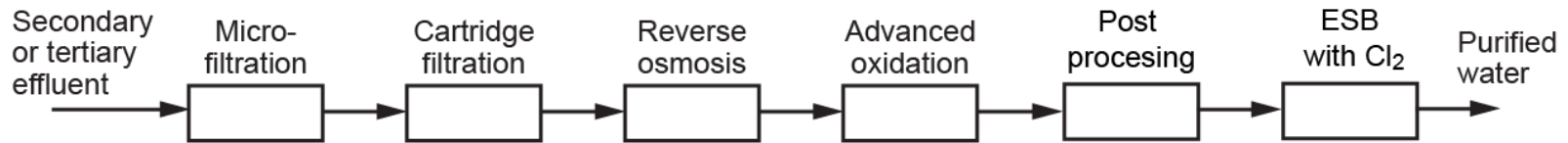
PURPOSE OF ADVANCED TREATMENT

To produce *purified* or *finished* water that meets all applicable federal, state, and local potable water reuse regulations that can serve as a water supply source or finished water

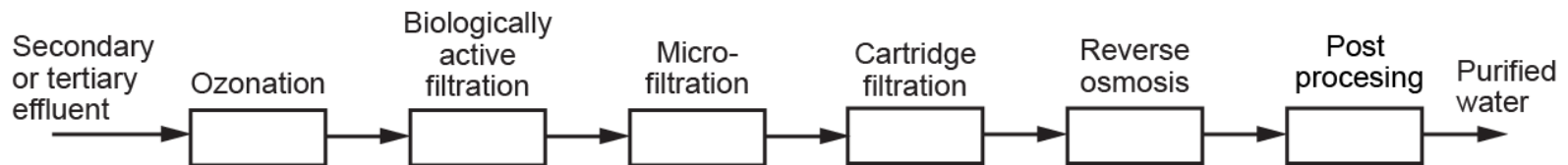
DIFFERENCES BETWEEN SECONDARY WASTEWATER TREATMENT PROCESSES



TYPICAL TREATMENT TRAINS FOR ADVANCED WATER TREATMENT



(a)

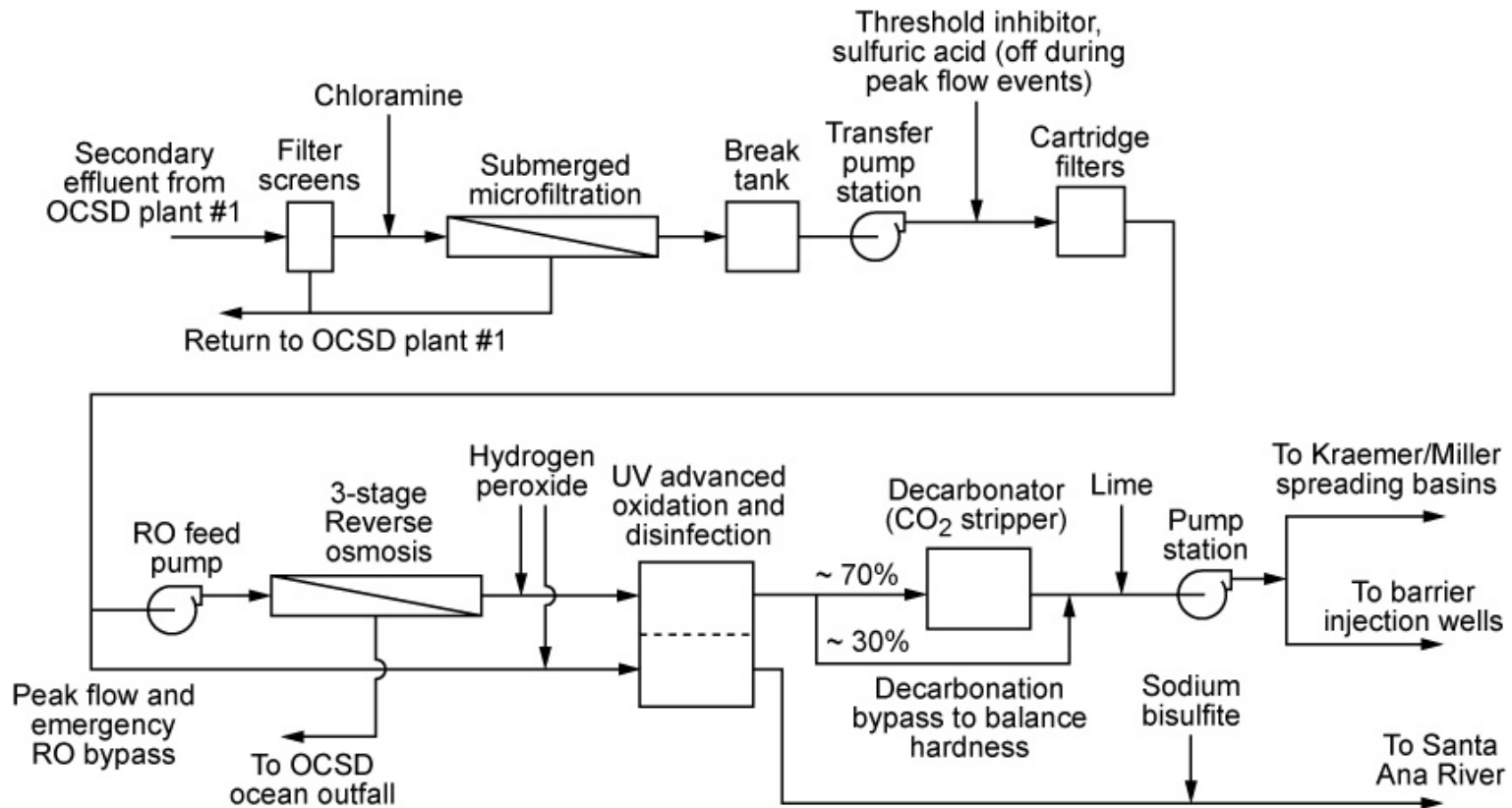


(b)



(c)

Technologies for the Indirect and Direct Potable Reuse



Adapted from OCWD

Microfiltration, Cartridge Filters, Reverse Osmosis, and Advanced Treatment (UV) Technologies at OCWD



OPERATOR REQUIREMENTS FOR DPR FACILITIES

- Production of ***purified*** water in an AWT facility not certified as a drinking water plant

Licensed wastewater operators, but licensed drinking water operators are recommended.

- Production of ***finished*** water in an AWT facility permitted as a drinking water plant

Licensed wastewater and drinking water operators.
Licensed drinking water operators are required by law for a finished water AWT facility.

- Production of ***purified*** or ***finished*** water in an AWT facility

Perhaps a new category of certification “**Advanced Treatment Technologies Operator**” which encompasses water quality, water treatment, and wastewater treatment technologies should be established.

WHAT DOES DPR COST?

| Supply option | Cost, \$/AF | | | |
|--|---------------|----------------------|---------------------------------|------------------------------------|
| | Treatment | Residuals Management | Concentrate or brine management | Conveyance and blending facilities |
| AWT (IPR) with RO | 685 - 900 | 10 - 50 | 70 - 700 | 100 - 1,000 |
| AWT (DPR) with RO | 700 - 1,000 | 10 - 50 | 70 - 700 | 100 - 1,000 |
| AWT (IPR) without RO | 500 - 700 | 10 - 50 | - | 100 - 1,000 |
| AWT (DPR) without RO | 500 - 800 | 10 - 50 | - | 100 - 1,000 |
| Brackish groundwater desalination (inland) | 900 - 1,250 | 20 - 100 | 70 - 700 | 300 - 2,000 |
| Sea water desalination | 1,800 - 2,100 | 20 - 100 | 100 - 200 | 400 - 3,000 |
| Imported water | 400 - 1,300 | | - | 100 - 600 |
| Water use efficiency, conservation, and use restrictions | 450 - 950 | | | 100 - 400 |

Note: $\$/10^3 \text{ gal} \times 325.89 = \$/\text{AF}$

DPR ENERGY IMPLICATIONS

| Technology/Water Source | Energy Required | | | Carbon footprint kg CO _{2e} /AF |
|--|------------------|---------|-------------------------|---|
| | Range, kWh/AF | Typical | | |
| | | kWh/AF | kWh/10 ³ gal | |
| Secondary treatment without nutrient removal | 330 – 520 | 450 | 1.38 | 244 |
| Tertiary treatment with nutrient removal effluent filtration | 520– 670 | 600 | 1.84 | 325 |
| Advanced water treatment | 1,050 - 1,140 | 1080 | 3.31 | 585 |
| Ocean desalination | 3,100 – 4,900 | 3,900 | 11.97 | 2,112 |
| Brackish water desalination | 1,00 – 2,000 | 1,900 | 5.83 | 1,029 |
| California State Project water ^e | 3,000 – 5,300 | 3,300 | 10.13 | 1,787 |
| Colorado River water | 2,000 - 2,600 | 2,000 | 6.14 | 1,083 |
| Conventional water treatment | 120 - 130 | 124 | 0.38 | 43 |
| Membrane based water treatment | 140 - 150 | 145 | 0.45 | 79 |

Note: kWh/10³ gal x 325.89 = kWh/AF