WATER REUSE 101 - INTRODUCTION TO WATER REUSE

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San Marcos, Texas
Overview

• What is Water Reuse?
• Factors Driving Water Reuse
• Types of Water Reuse
  – Case Studies
• Benefits of Water Reuse
• What Water Reuse is Not
What is Water Reuse?

To use again; recycle; to intercept, either directly or by exchange, water that would otherwise return to the natural hydrologic (water) system, for subsequent beneficial use.
What is Water Reuse?

• The beneficial use of wastewater that has been purified so its quality is suitable for the intended use

• Offers a climate independent water source

No NEW water
What is Water Reuse?

Reuse Water

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Reclaimed Water

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Recycled Water
Factors Driving Water Reuse

- Drought
- Population growth
- Increased municipal, industrial, and agricultural demand
- Dependence on single source of supply
- Restrictions on wastewater discharges (nutrient limitations)
Factors Driving Water Reuse

- De Facto Water Reuse
  - Unintended withdrawal of wastewater effluent for drinking water purposes

- Nonpotable Reuse
  - Agriculture and Landscape Irrigation “Purple Pipe”

- Indirect Potable Reuse
  - Augmentation of reservoirs and/or aquifers

- Direct Potable Reuse
  - Direct connection between wastewater treatment and drinking water

- Increasing Scarcity of Potable Water

- Increasing Cost of Imported or Alternative Water Supplies
Types of Reuse

- Nonpotable Reuse (NPR)
- Indirect Potable Reuse (IPR)
- Direct Potable Reuse (DPR)
- “De Facto” Reuse
NONPOTABLE REUSE
Nonpotable Reuse (NPR)

- Includes all recycled or reclaimed water reuse applications except those related to drinking water
- Dual Distribution Systems (Purple Pipe)
Nonpotable Reuse (NPR)

- Business And Industry
- Agriculture/ Irrigation
- Wastewater Treatment
- Nonpotable Users
- Community
- Raw Water Sources
- Drinking Water
- Customers
Irrigation Quality Reuse

• Most common and publicly accepted form of reuse
• Urban and suburban applications
  – Common space, parks, and public property
  – Business and residential lawn irrigation
  – Strong foundation of health risk-related research to support the safety of this practice
• Agricultural (namely food crop) applications
  – Common in California
  – Occurs in Florida
  – Topic of rule making in Colorado, Hawaii and others
  – Additional monitoring, mainly for pathogens, is generally required
Monterey, CA Regional Water Pollution Control District- Agricultural Reuse

- World's largest water recycling facility designed for raw food crop irrigation – 30 mgd with tertiary treatment
- Originally designed as a salt water intrusion barrier source
- Supplies reuse for 12,000 acres of prime farm land

- Includes world’s largest artichoke supplier
- Many other vegetables and fruits

Turning Wastewater Into Safe Water
Eastern Municipal Water District, CA – Agricultural Reuse

• Four facilities, 45 mgd capacity
• Tertiary treated recycled water
• Additional treatment via created wetland habitat
• Agricultural irrigation
  – Fruits and vegetables
  – Fodder for cattle
• Non crop irrigation
• Industrial reuse
El Paso Water Utilities, TX Reclamation Systems- Urban/Suburban

• Almost 6 mgd of reclaimed water
• System supplies
  – golf courses
  – city parks
  – school grounds
  – apartment landscapes
  – construction
  – industrial sites
• Two additional projects are under construction
Santa Clara Valley Water District, CA - Industrial

- 8 mgd of purified water
- Uses microfiltration, reverse osmosis & ultraviolet disinfection
- Current uses
  - Manufacturing
  - Irrigation
- Future uses
  - Planning for potable reuse
Four Producers in Santa Clara Area – Recycled Water Produced v. Reused

Recycled Water – Untapped Remaining Resource

Produced

Reused
West Basin Municipal Water District, CA - Industrial

• 35 mgd of tertiary water
  – additional treatment at decentralized facilities

• Use for:
  – Irrigation
  – groundwater recharge
  – industrial applications
West Basin MWD

Different treatment levels for different uses

1. Filter and add chlorine
   - Most water purification plants stop here

2. Take ammonia out of irrigation water

3. Filter through plastic sheet (i.e., reverse osmosis)

4. Filter through plastic sheet 2x (double reverse osmosis)

5. Multiple high tech processes

- Well water and indirect drinking water

The right water for the right use
WATER REUSE FOR THE COMMUNITY
Denver Water – Denver Zoo Partnership

- Denver Water produces 30 mgd of tertiary recycled water for:
  - Xcel Energy – 10 mgd cooling water
  - Parks
  - Golf courses
  - Zoo
  - Commercial and industrial users
  - Denver Zoo - 2 mgd

- Phase 2 would expand the recycling system to 45 mgd
Oregon’s Lott Clean Water Alliance

East Bay Public Plaza Reclaimed Water Wading Stream

- Interactive water feature mimics a natural stream from waterfall to Bay including “groundwater seeps”
- Class A Reclaimed Water (100 mgd)
- Attracts hundreds of families and visitors each summer
San Antonio, TX Water Recycling

• 130 miles of pipeline delivers 29 mgd of recycled water to:
  – Golf courses
  – Parks
  – Commercial
  – Industrial
  – Also remaining recycle flows provide baseflows for Upper San Antonio River (famed River Walk) and Salado Creek
INDIRECT POTABLE REUSE
Indirect Potable Reuse (IPR)

• The blending of advanced treated recycled or reclaimed water into a natural water source (groundwater basin or reservoir) that could be used for drinking (potable) water after further treatment
Indirect Potable Reuse (IPR)

- Other Water Sources
- Water Treatment
- Drinking Water
- Customers
- "Environmental Buffer"
- Wastewater Treatment (often with some advanced treatment)
Orange County Water District, CA – Groundwater Replenishment

- Groundwater = 70% local supply for 2.4 million residents
- 14”/yr rainfall (semi-arid)
- Seawater intrusion threatens groundwater quality
- Potable reuse is a critical component of basin replenishment
  - Excellent water quality (high-level purification/treatment)
  - Reliable
  - Cost-effective
Groundwater Replenishment System Partnership

OCSD
Source Control

Primary Treatment

Secondary Treatment

OCWD

Groundwater Recharge Basins

Seawater Barrier Injection Wells

Microfiltration (MF)
Reverse Osmosis (RO)
Ultraviolet Light (UV) with Hydrogen Peroxide

100 mgd
DIRECT POTABLE REUSE
Direct Potable Reuse (DPR)

The introduction of advanced treated reclaimed water either directly into the potable water system or into the raw water supply entering a drinking water treatment plant.
Direct Potable Reuse (DPR)
DPR CASE STUDIES
CRMWD at Big Spring Treatment Process

Screening → Primary Clarifiers → Aeration Basins → Final Clarifiers → Chlorination → Dechlorination

Wastewater Treatment

Thomas Pipeline → Spence Pipeline

Raw Water Reservoir → UV Oxidation → Reverse Osmosis → Membrane Filtration

Rapid Mix → Flocculators → Sedimentation Basins → Filters

CRMWD
City of Wichita Falls, TX

- Population ~ 104,000
- Existing Water Supplies
  - Lake Kickapoo
  - Lake Arrowhead
  - Lake Kemp (high TDS)
- Water Treatment Plants
  - Jasper- 24 mgd
  - Cypress- 52 mgd
    - 42 mgd conventional
    - 10 mgd MF/RO
      - for Lake Kemp water

Precipitation ~22 in/yr
DE FACTO REUSE
“De Facto” Reuse

When a community draws water from a river or reservoir that includes treated wastewater discharged by upstream communities
“De Facto” Reuse

- Conventional Wastewater Treatment
  - Discharge Upstream
  - Diversion Downstream
  - Water Treatment
  - Drinking Water
  - Repeat Downstream
  - Customers
DE FACTO REUSE CASE STUDY
De Facto Indirect Potable Reuse in the Trinity River Basin
BENEFITS OF WATER REUSE

Water Reuse
A Sustainable and Safe Solution to a Short Supply
Benefits of Water Reuse

• Dependable Source of Supply
• Locally Controlled
• Environmentally Friendly
• Augments Existing Supplies
WHAT WATER REUSE IS NOT!
What Water Reuse is NOT

Water Reuse ≠ Greywater

Water Reuse ≠ Wastewater
The End

Questions?

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