

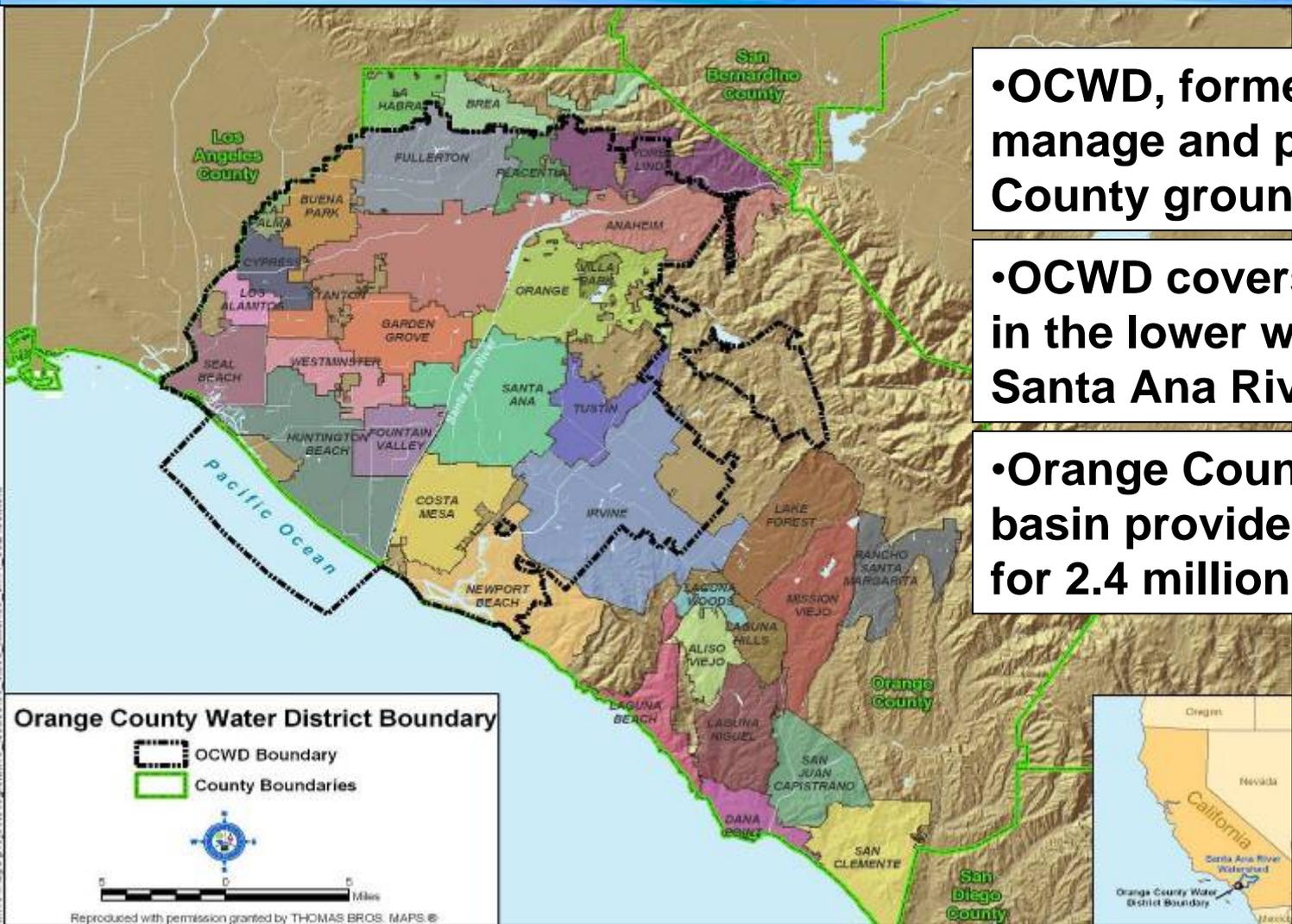


Better the Second Time Around Orange County's Groundwater Replenishment System:

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Orange County Water District
CCLHO - Newport Beach
May 13, 2010



Orange County Water District



•OCWD, formed in 1933 to manage and protect Orange County groundwater basin

•OCWD covers 229,000 acres in the lower watershed of the Santa Ana River (SAR)

•Orange County groundwater basin provides 2/3 of water for 2.4 million people

Orange County Water District Boundary

- OCWD Boundary
- County Boundaries



0 5 Miles

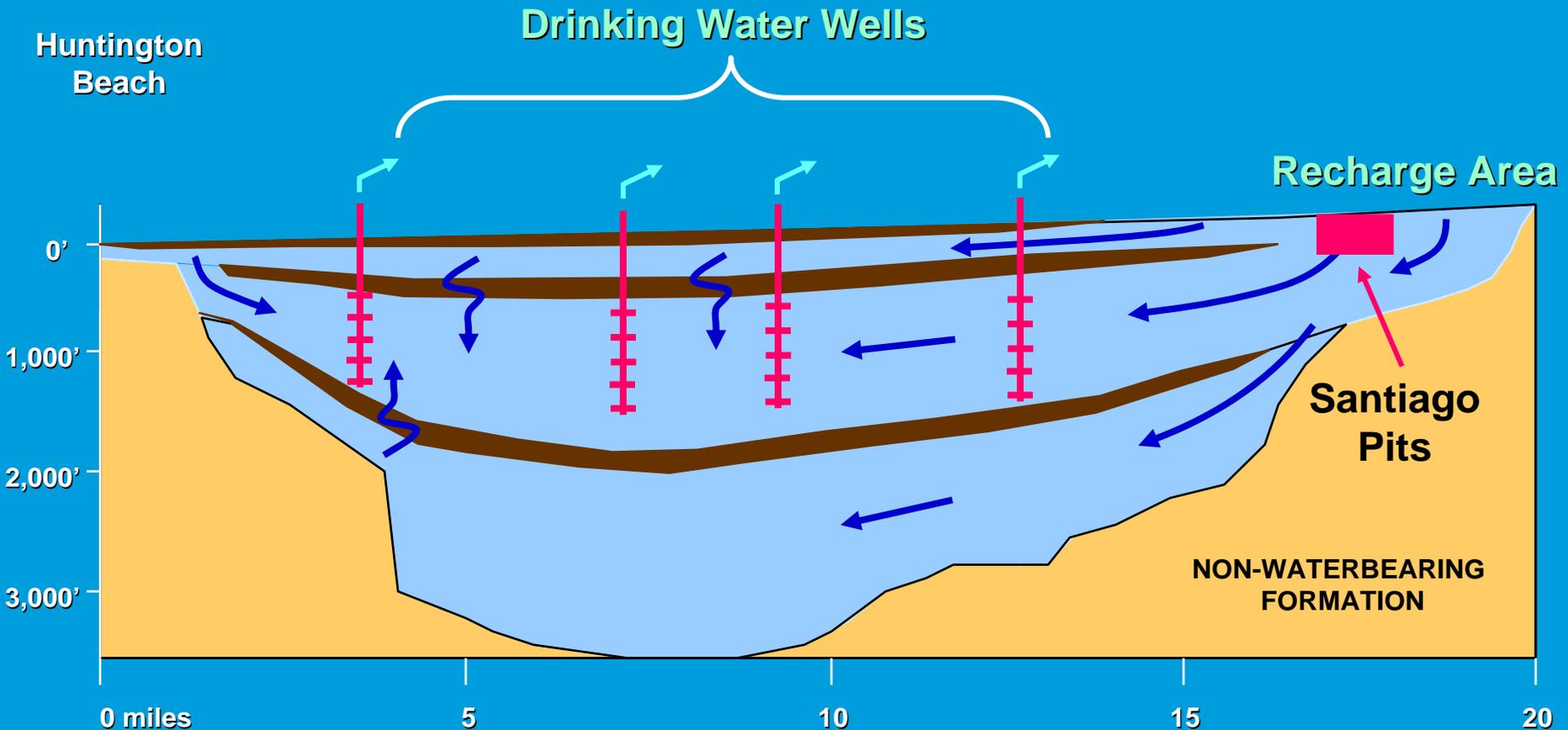
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OCWD Functions

Protect Water Quality * Manage Pumping * Replenish Basin





Orange County Needs New Water Sources

- ▶ Traditional water supplies less reliable
- ▶ Conservation not enough
- ▶ Colorado River now shared with other states, longer droughts – Lake Mead drying up?
- ▶ State Water Project – variable snowpack, extended droughts, vulnerable delta, endangered species protection
- ▶ Santa Ana River - local droughts, increased recycling upstream, more rapid runoff during storms





History of Potable Reuse in OC

▶ Water Factory 21

- Operated 1976 to 2004
- Lime clarification, sand filtration, GAC, RO
- 5 MGD GAC, 5 MGD RO, 5 MGD well water



▶ Interim Water Factory

- Operated 2004 to 2006
- MF, RO, UV-AOP
- 5 MGD, 10 MGD imported water





Advances in Water Treatment

- ▶ Technology has evolved
- ▶ Microfiltration better pretreatment
- ▶ Newer TFC RO membranes - lower pressure, better rejection (higher quality), higher flux (more flow)
- ▶ UV disinfection, photolysis, and advanced oxidation (AOP) to destroy chemicals not removed by RO
- ▶ On line sensors, PCS, and SCADA systems provide real time info on treatment performance, auto shutdown





Potable Reuse is Hard to Accept

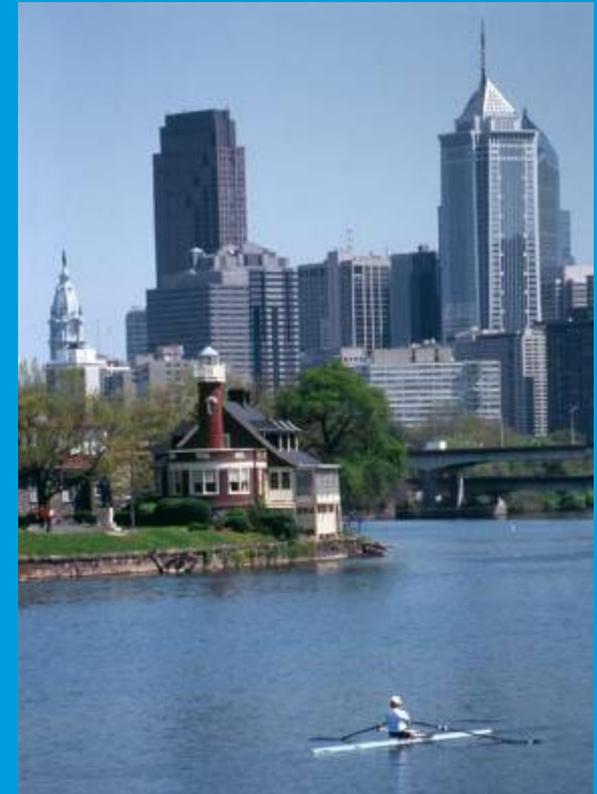
- ▶ Planned potable reuse tough concept
- ▶ Unplanned reuse occurs everywhere
- ▶ Many utilities fail to gain community acceptance for planned potable reuse
- ▶ Changing conditions may change attitudes





Widespread Unplanned Potable Reuse

- ▶ Most major water supplies have wastewater component
- ▶ OC depends on Colorado River, State Water Project, Santa Ana River (wastewater dominated)
- ▶ Philadelphia - Schuylkill River
- ▶ Cincinnati – Ohio River
- ▶ Washington D.C. – Occoquan River
- ▶ Worldwide - rivers receive wastewater and provide drinking water





GWR System Components





GWRS Purification Process

Multiple Barriers

Microfiltration (MF)

OCSD
Secondary
Effluent

Normally
Goes to
Ocean



Backwash
to OCSD
treatment

Reverse
Osmosis
(RO)



Brine to
OCSD Outfall

Ultraviolet Light (UV)
with Hydrogen Peroxide



Expanded
Seawater
Barrier

Recharge
Basins in
Anaheim



Source Control

- ▶ Orange County Sanitation District “enhanced source control”
- ▶ Regulate discharges into sewer to prevent contamination
- ▶ First step in producing drinking water, first barrier
- ▶ OCWD helps identify compounds of concern and efficacy of advanced treatment
- ▶ Divert non-reclaimable wastes to different plant





Microfiltration System



- ▶ 86 MGD hollow fiber microfiltration (MF)
- ▶ Submersible system
- ▶ 90% recovery rate
- ▶ Tiny, straw-like, polypropylene membrane
- ▶ 0.2 micron pore size
- ▶ Removes bacteria, protozoa, and suspended solids



Reverse Osmosis System



- ▶ 70 MGD reverse osmosis system
- ▶ TFC membranes
- ▶ Pressure range: 150-200 psi
- ▶ 3 stage RO
- ▶ 85% recovery rate
- ▶ Removes dissolved minerals, viruses, and organic compounds (incl. pharmaceuticals)



Ultraviolet/Advanced Oxidation System



- ▶ 70 MGD UV System
- ▶ Low Pressure – High Output (254 nm lamps)
- ▶ Hydrogen peroxide
- ▶ 8.75 MGD per train
- ▶ 6 reactors in series/train
72 lamps/reactor
- ▶ Powerful disinfection
- ▶ Photolysis and AOP
destroy trace organics



Stabilization and Storage

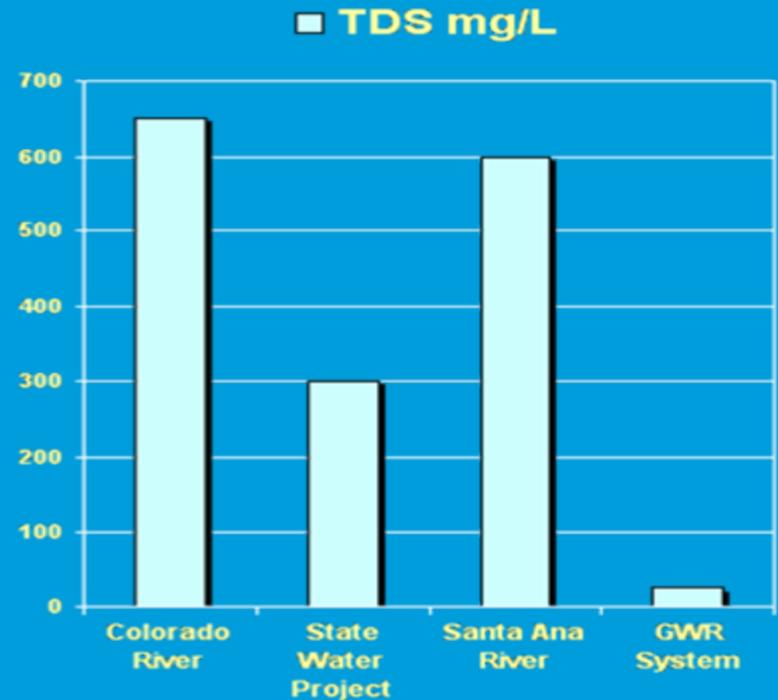
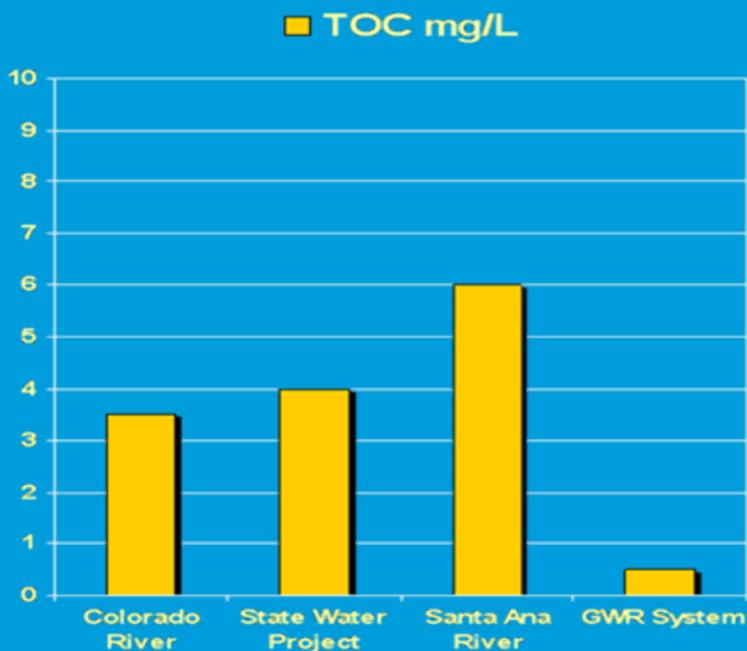


- ▶ Decarbonation and lime stabilize purified water
- ▶ GWR System water pumped to seawater barrier and spreading basins
- ▶ Natural soil filtration and buffering - final step in aquifer prior to extraction
- ▶ Provides “kiss of nature”



Water Quality - Better Than Other Sources

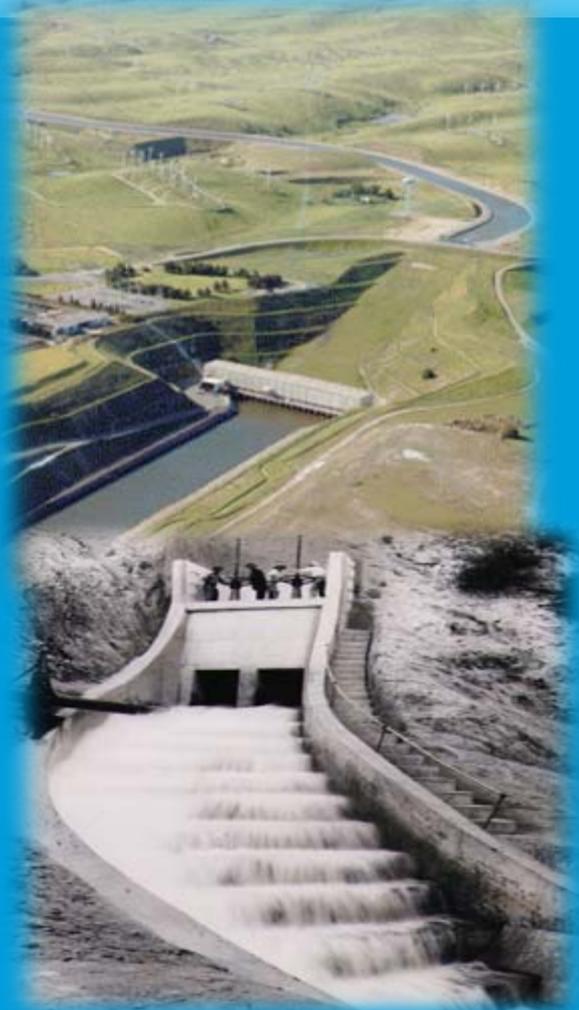
- ▶ TOC (organic compounds) and TDS (salts) difference between GWR System water and alternatives





Benefits of GWR System

- ▶ Locally controlled reliable supply
- ▶ Bolsters seawater intrusion barrier
- ▶ Provides water to refill the basin during drought
- ▶ Helps meet needs of growing population
- ▶ Eliminates need for new ocean outfall
- ▶ Recycles valuable resource
- ▶ About ½ the energy to import water from Northern California
- ▶ Improves water quality in the basin





How Much Did GWR System Cost?

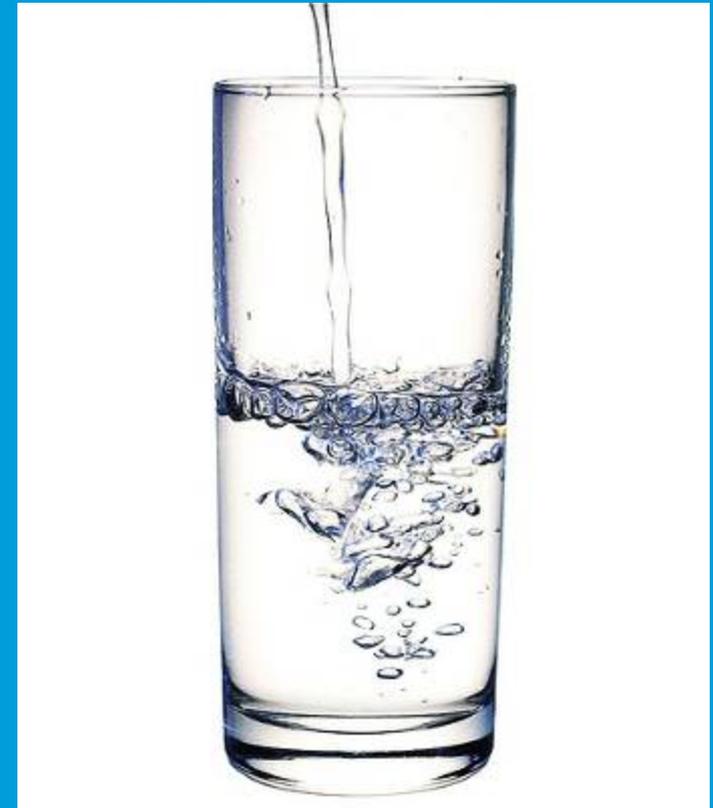
- ▶ \$480 million total project costs for treatment, pipeline, and injection wells
- ▶ \$92 million state and federal grants
- ▶ Remaining capital cost split with OCSD (\$195 million each, equivalent to a new ocean outfall)

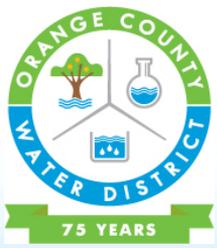




Regulatory Oversight

- ▶ **California Dept. of Public Health (CDPH) establishes recycling criteria**
 - Treatment and quality
 - Travel time
 - Blending
- ▶ **Regional Water Quality Control Board issues reclamation permit**
- ▶ **Regional Board incorporates CDPH recommendations into permit**





Independent Scientific Review

► Independent Advisory Panel appointed by National Water Research Institute

- 13 experts in engineering, chemistry, microbiology, toxicology, hydrogeology, public health, public outreach, environmental impact
- Annual meeting to review operations, monitoring, water quality, communications
- Attended by regulators and key stakeholders
- Recommendations guide testing and changes in operations





Public Outreach

- ▶ Many projects stopped by public and political opposition
- ▶ Outreach began early, over 10 years prior to GWR System start up
- ▶ Researched public concerns
- ▶ Face to face presentations
- ▶ Letters of support from leading groups and elected officials
- ▶ Measured effects of outreach
- ▶ Community support
- ▶ Outreach continues today, assisted by media interest
- ▶ Website helps disseminates info





Keys To Support for GWR System

- ▶ Meets Orange County's water needs
- ▶ Protects public health
- ▶ Produces highest quality water
- ▶ History of potable reuse with Water Factory 21
- ▶ Groundwater - natural and psychological barrier
- ▶ Effective outreach from conception to operation





What Have We Learned from Potable Reuse in OC?

Public can accept potable reuse if:

- ▶ Need is clear
- ▶ Safety is assured - multiple barriers
- ▶ Quality is better than alternatives
- ▶ Public health agencies have continuing oversight
- ▶ Independent scientific review
- ▶ Outreach is effective and ongoing
- ▶ Politicians and community leaders make commitment





What Does the Future Hold?

- ▶ **Good news/bad news**
- ▶ **Good news:**
In the future we will all be drinking our own sewage
- ▶ **Bad news:**
There may not be enough to go around

