GWRS
GROUNDWATER REPLENISHMENT SYSTEM

Facts and Figures

Overview

The Groundwater Replenishment System (GWRS) is the world's largest wastewater purification system for indirect potable reuse (IPR).

The GWRS takes highly treated wastewater that would have previously been discharged into the Pacific Ocean and purifies it using a three-step advanced treatment process consisting of microfiltration, reverse osmosis and ultraviolet light with hydrogen peroxide. The process produces high-quality water that exceeds all state and federal drinking water standards.

Operational since January 2008, this state-of-the-art water purification project can produce up to 70 million gallons (265,000 cubic meters) of high-quality water every day. This is enough water to meet the needs of nearly 600,000 residents in north and central Orange County, California.

The Design and construction of the GWRS was jointly-funded by the Orange County Water District (OCWD) and the Orange County Sanitation District (OCSD). These two public agencies have worked together for more than 30 years. Together they are leading the way in water recycling and providing a locally-controlled, drought-proof and reliable supply of high-quality water in an environmentally sensitive and economical manner.

Three-Step Process

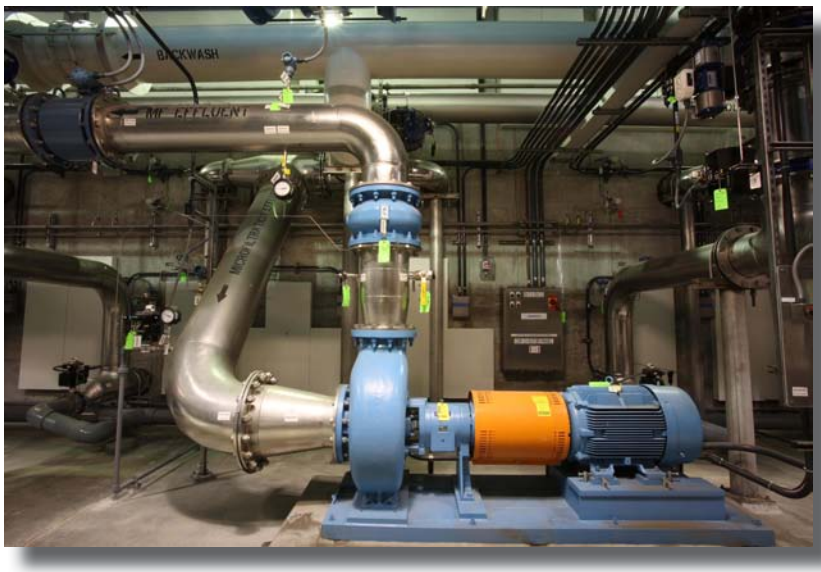
1 Microfiltration

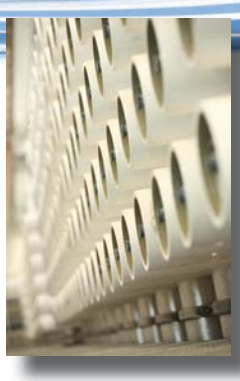
Microfiltration (MF) is a separation process that uses polypropylene hollow fibers, similar to straws, with tiny holes in the sides that are 0.2 micron in diameter (1/300 the diameter of a human hair). By drawing water through the holes into the center of the fibers, suspended solids, protozoa, bacteria and some viruses are filtered out of the water.

MF Factoids

- Secondary treated wastewater from OCSD is pulled by vacuum through 0.2 micron holes (1/300 the diameter of human hair) in the sides of the hollow fiber MF membranes. The MF straw-like membranes clean the water for the next step, Reverse Osmosis (RO).
- Each MF membrane-module contains approximately 15,000 fibers (straws).
- While the water in the MF basins appear to be sitting still, the water is actually being filtered and new water is added automatically.
- MF removes bacteria, protozoa, particles and some viruses attached to them.
- When GWRS is fully operational, OCSD provides 96 million gallons (364 megaliters; 364,000 cubic meters) per day of secondary treated effluent.
- Sodium hypochlorite (bleach) is added to the secondary effluent to prevent biological fouling on the MF membranes.
- The MF process results in a 10% loss of water, leaving 86 million gallons (325 megaliters; 325,000 cubic meters) per day going to Reverse Osmosis (RO), the 2nd step of the GWRS process, and the Green Acres Project (GAP), which is a water recycling effort that has been providing reclaimed water since 1991 for landscape irrigation at parks, schools and golf courses as well as for industrial uses, such as carpet dyeing. Approximately 4 million gallons (15 megaliters; 15,140 cubic meters) of MF filtered water per day goes to GAP while the rest goes to RO.
- All of the concrete MF basins hold 4 cells - all in a row.
- Each cell holds 19 membrane racks.
- Each MF membrane rack holds 36 MF membrane modules.
- Each cell holds about 684 MF modules.
- There are a total of nearly 18,000 MF modules in the GWRS. Each MF module costs approximately $600.
- The total MF filtering surface area of all the straw-like membranes is equal to 117 U.S. football fields.
- Each MF cell produces 3.3 million gallons of water per day.
- Each cell has identical pipes and pumps so each can be operated independent of the overall system for maintenance.

- Each cell is backwashed every 22 minutes with an air scour, and water is sent back through the straw-like membranes in the opposite direction to clean the membranes.
- Each MF cell has an input (influent) side and an output (effluent) side.
- Every 21 days the cells are cleaned in place for 4 hours with sodium hydroxide, citric acid and manufacturer's cleaning compound.
- If the 22 minutes and 21 day cleaning schedule is maintained, the MF membrane modules can be operational for 5-7 years.
- The MF backwash water goes to an underground tank and is then pumped back to OCSD to be treated again. Some of that water comes back to be filtered again at the GWRS.
- There are 26 MF cells, 16 on the east side of the GWRS plant, and 10 on the west side.
- MF product water is similar in quality to tertiary treated water that is used for landscape irrigation.
- The pipes and pumps for the MF are located underground because the water flows by gravity from OCSD to the GWRS plant at OCWD, which saves energy and money.
- Pneumatic values are opened and closed automatically by computers to maintain proper water flow into the MF cells.
- It takes about 3 to 12 PSI (Pounds per Square Inch) of suction (negative pressure) to pull the water through the straw-like MF membranes. It is very low pressure.
- 60 Horse Power (HP) (44,000 watts) pumps move the MF filtered water to a 2 million gallon (7.5 megaliters; 7,500 cubic meters) break tank reservoir located outside of the MF area, and then on to the Reverse Osmosis (RO) building. Before the water goes to RO, an anti-scalant and sulfuric acid is added to the water to protect the RO membranes from mineral build up (lowers pH to 6.0).
- The MF break tank reservoir allows the GWRS to feed an even flow of MF water into the RO membranes.
- Inside a nearby Transfer Pump Station are 1250 HP (919,000 watts) motors that power the pumps that move the water from MF to RO and 600 HP (441,000 watts) motors that power the pumps that move some of the MF water back to MF to clean the MF membranes by pushing water back through the straw-like membranes.
- Siemens Water Technologies is the equipment supplier of the MF membrane-modules.





2 Reverse Osmosis

The Heart of the Purification Process

Reverse osmosis (RO) membranes are made of semi-permeable polyamide polymer (plastic). During the RO process, water is forced through the molecular structure of the membranes under high pressure, removing dissolved chemicals, viruses and pharmaceuticals in the water. The end result is near-distilled-quality water so pure that minerals have to be added back in to stabilize the water. RO has been successfully used by OCWD since the mid-1970s to purify highly-treated wastewater for its seawater intrusion barrier at its Water Factory 21 (WF-21) from 1975-2004.

RO Factoids

- RO is the heart of the GWRS purification process because it effectively removes potentially harmful compounds from wastewater, including dissolved chemicals, viruses and pharmaceuticals.
- OCWD has more than 30 years of experience purifying sewer water with RO at its world famous WF 21 (1975 to 2004) and now at the GWRS (2008 to present).
- WF-21 was the first plant in the world to use RO to purify sewer water to drinking water standards.
- WF-21 produced about 5 million gallons (19 megaliters; 19,000 cubic meters) per day of RO permeate. The newer and improved GWRS produces up to 70 million gallons (265 megaliters; 265,000 cubic meters) per day of purified water.
- An RO membrane is a spiral wound sheet of plastic (polyamide polymer) wrapped around a small plastic pipe with holes in the sides.
- Water under high pressure is forced through the molecular structure of the plastic RO membrane (water passes through an RO membrane and spins to the center pipe).
- If the water does not pass through an RO membrane the first go around, it moves on to another set of membranes until 85% of the water that began the RO process is purified. To accomplish that, the water goes through a three stage, single pass system of RO membranes (78 in the first stage, 48 in the second stage and 24 in the third stage).
- WF-21 needed as high as 600 PSI to move the water through the membranes. Today, that pressure has been reduced to approximately 150 PSI by new membranes that actually produce a higher quality of water at lower pressures.
- The RO process removes dissolved salts or minerals, and organic materials like fertilizers and pesticides, pharmaceuticals and viruses, producing near-distilled-quality water.
- There are 15 units of RO that each produce 5 million gallons (19 megaliters; 19,000 cubic meters) of high-quality water per day.
- Each RO unit has individual pipes and a dedicated pump with a 1,000 HP (736,000 watts) motor so that each one can be operated independently.

- Each RO unit contains 150 long white pressure vessels or tubes.
- Each white pressure vessel or tube holds 7 RO membranes for a total of nearly 16,000 RO membranes in the system.
- Each RO membrane costs approximately $450 and last 5 years.
- RO receives 82.5 million gallons (313 megaliters; 313,000 cubic meters) per day of MF filtered water and produces 70 million gallons (265 megaliters; 265,000 cubic meters) per day of pure water.
- The RO brine or concentrated reject water goes back to OCSD and out its ocean outfall.
- Hydranautics is the manufacturer of the GWRS RO polyamide polymer membranes.

3 UV with H_2O_2

Water is exposed to high-intensity ultraviolet (UV) light with hydrogen peroxide (H_2O_2) to disinfect and destroy any trace organic compounds that may have passed through the reverse osmosis membranes. Examples of these trace organic compounds are N-Nitrosodimethylamine (NDMA) and 1-4 Dioxane, which have to be removed to the parts-per-trillion level. UV with H_2O_2 is an effective disinfection/advanced oxidation process that keeps these compounds from reaching drinking water supplies.

UV with H_2O_2 Factoids

- The GWRS is designed as a multiple barrier system. Treating the water with UV with H_2O_2 is an additional safety measure.
- There are 9 trains of UV consisting of three vessels in a series stacked on top of each other.
- Each UV train treats 8.75 million gallons per day (33 megaliters or 33,122 cubic meters).
- Each UV vessel holds two reactors with 72 low-pressure, high-intensity 250 watt lamps for a total of nearly 4,000 lamps in the entire system.
- The UV with H_2O_2 system destroys low molecular weight, trace organics like NDMA (n-nitrosodimethylamine), which is a highly toxic substance and suspected human carcinogen, and 1,4 Dioxane.
- The GWRS water moves through each train from the bottom UV vessel to the middle and then the top vessel in a matter of seconds.
- Each individual UV lamp costs approximately $100, lasts one year and is encased in a special quartz sleeve so the water never actually touches the UV light bulb.
- UV processes 70 million gallons (265 megaliters; 265,000 cubic meters) per day of purified water.
- Trojan is the manufacturer of the UV system.

Other GWRS Process Factoids

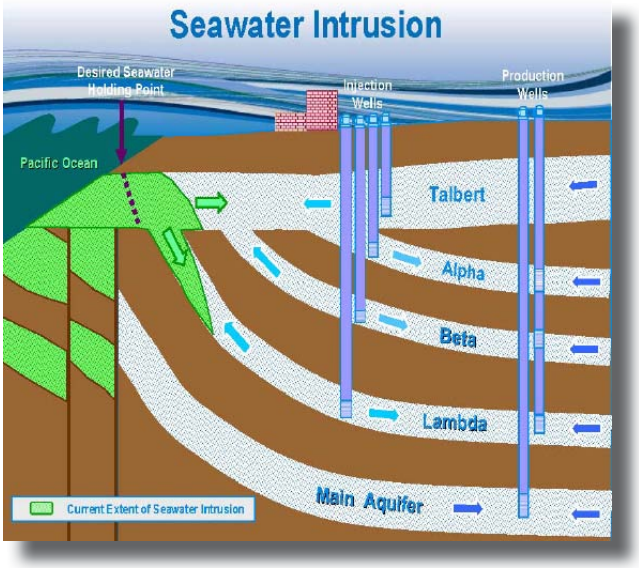
- It only takes approximately 45 minutes to purify wastewater at the GWRS.
- After the water leaves UV with H_2O_2 it goes to 1 of 5 decarbonators which are like artificial waterfalls that take the CO_2 (carbon dioxide) out of the water and raises the pH of the water.
- Because the water is so pure, minerals (calcium hydroxide or lime) are added to the water to form calcium bicarbonate to stabilize the water and to prevent the water from leaching minerals out of the concrete pipes.
- The entire GWRS is computer operated on a 24 hours/day, 7 days/week schedule.
- Water quality is monitored by computers and people. Together they monitor such things as pH levels, total organic carbon (TOC), turbidity, and pressure.
- There are 4 GWRS operators on each 12 hour shift.
- Operators are assisted during the normal workday by 4 instrument and electrical technicians, 14 maintenance technicians and 2 process and control experts.
- The Process Control System (PCS) allows GWRS to be monitored from the control room - right down to identifying whether each of the 4,000 UV light bulbs is functioning.
- The PCS uses Emerson Delta V software and was designed by the design engineering firm of Camp, Dresser & McKee (CDM).

Where Does GWRS Water Go?

The GWRS has a current production capacity of 70 million gallons (265,000 cubic meters; 215 acre-feet) of water per day and a total production of 23.5 billion gallons (89 million cubic meters; 72,000 acre-feet) per year. After water is treated with the three-step process at the GWRS, approximately 35 million gallons (132,500 cubic meters) of GWRS water per day is pumped into injection wells where it serves as a seawater intrusion barrier. Another 35 million gallons (132,500 cubic meters) per day is pumped to recharge basins in Anaheim, California, where GWRS water filters through sand and gravel to replenish the deep aquifers of north and central Orange County's groundwater basin.

Seawater Barrier

The threat of salt water from the ocean contaminating Orange County's groundwater basin has been a concern for decades. The groundwater basin is the county's primary potable water supply and provides storage for nearly 500,000 acre-feet (616,000 cubic meters) of usable water. As the region has continued to grow, water demands have risen. Pumping more water out of the basin, increases the possibility of salt water seeping into the basin.



The Orange County Water District (OCWD) built Water Factory 21 (WF-21) in the mid-1970s to treat wastewater and inject it into 23 wells along the coast, creating a seawater intrusion barrier. As demands to pump more water out of the basin increased, the barrier required more purified water than WF-21 could produce, which had a daily production of 22.6 million gallons (85,600 cubic meters) per day. (14 million gallons (53,000 cubic meters) of WF-21 water blended with 8.6 million gallons (32,600 cubic meters) of deep well water.

With the completion of the GWRS, OCWD now produces enough water to form a highly protective barrier that safeguards Orange County's fresh water supply. About half of the water produced by GWRS (35 million gallons; 132,000 cubic meters) is injected into the seawater intrusion barrier every day.

Groundwater Recharge

The Orange County Water District (OCWD) is responsible for managing the very large groundwater basin that provides approximately 60% of the potable water supply for 2.4 million residents of north and central Orange County.

In 1936, OCWD began purchasing portions of the Santa Ana River channel to actively manage capture of the river water as a source of supply for the groundwater basin. Today, OCWD owns approximately 1,000 acres contained within a six-mile section of the Santa Ana River from Imperial Highway to Ball Road in Anaheim, California. There are more than two dozen recharge basins in this area that range in depth from 5 to 150 feet (1.5 to 45 meters).

After water is purified through the GWRS, about half of it is pumped in a 13-mile (21 kilometers) pipeline to two of OCWD's recharge basins, Kraemer and Miller, in Anaheim. The GWRS water percolates through the sand and gravel in these basins and naturally filters into the county's groundwater basin. This groundwater is pumped from over 400 wells operated by local water agencies, cities and other groundwater users. The GWRS is an important and effective way to replenish the groundwater basin.

Project Benefits

- Provides an uninterruptible source of water for seawater intrusion protection and groundwater recharge
- Decreases Southern California's dependency on water from the Sacramento-San Joaquin River Delta and the Colorado River
- Creates a locally-controlled, reliable supply of high-quality water that is drought-resistant
- Provides Orange County communities added assurance of sufficient water supplies to support economic vitality
- Produces high-quality water to replenish the groundwater basin
- Protects Orange County's groundwater basin from seawater intrusion
- Serves as a blueprint for water agencies throughout the world to help solve their local water supply issues
- Protects the environment by reusing a precious resource
- Reduces the amount of wastewater discharged to the Pacific Ocean
- Uses less than half the energy required to transport water from Northern to Southern California
- Demonstrates a successful partnership between public agencies
- Created thousands of jobs from development, construction and operation of the GWRS
- Postpones, possibly indefinitely, the need for OCSD to construct a second ocean outfall
- Diversifies water supplies in Southern California, minimizing negative impacts resulting from limitations on imported water supplies, natural disasters, climate change, and/or droughts
- Designed to be expanded to increase production capacity to help meet future water needs
- Improves groundwater quality by reducing the amount of dissolved solids (salt) in the groundwater basin
- Uses one-third the energy required to desalinate seawater

Regulatory Agency Approvals

The GWRS produces high-quality water that exceeds all state and federal drinking water standards.

The GWRS was reviewed, approved and permitted by the California Department of Public Health and California Regional Water Quality Control Board, Santa Ana River Basin, to ensure public health, water quality and environmental compliance. Approval for injection along the coast at Talbert Barrier was received on January 3, 2008 and began on January 18, 2008. While approval for percolation via Kraemer and Miller Basin was received and began on January 17, 2008. The permit establishes criteria for GWRS treatment, Total Organic Carbon (TOC) limits, and travel time and blending requirements.

One of the provisions of the permit requires that an Independent Advisory Panel (the Panel) provide an on-going periodic scientific peer review of the GWRS. The permit specifies minimum qualifications for the Panel members and requires that the Panel meet at least annually during the first five years, and then every two years thereafter. The Panel is appointed and administered by the National Water Research Institute (NWRI), and made up of experts in toxicology, chemistry, microbiology, hydrogeology, environmental engineering, public health and water treatment technology.

Below are documents that speak to the GWRS' stringent operations and exceptional water quality.

For additional information regarding GWRS water quality and regulatory issues, please contact: Jason Dadakis, Director of Health & Regulatory Affairs, Orange County Water District: (714) 378-3364 or jdadakis@ocwd.com.

- Executive Summary of 2008 GWRS Annual report
- 2008 GWRS Average Water Quality
- GWRS Permit Order R8-2004-0002
- GWRS Permit Amendment R8-2008-0058

Project Costs & Funding Sources

The capital cost to build the GWRS was $481 million (U.S. Dollars). Federal, state and local funding totaling $92.8 million was secured for the project. Grants included $37 million from the State Water Bond (Proposition 13) approved by California voters in 2000, $30 million from the California Department of Water Resources, $5 million from the State Water Resources Control Board awarded in 2002, $20 million from the United States Bureau of Reclamation's Title XVI program, $300,000 from the California Energy Commission, and $500,000 from the Environmental Protection Agency. OCWD and OCSD cost shared the remaining $388 million.

OCWD is responsible for management and funding of the GWRS operations. The annual operating budget for GWRS is approximately $34 million, which includes electricity, chemicals, labor and maintenance. The project receives an annual operational subsidy of $7.5 million (for 12 years) from the Metropolitan Water District of Southern California for reducing demand on the state's imported water supplies. OCWD receives revenue from assessments paid by the groundwater basin pumpers, a percentage of the local property taxes, and from investments.

Below is actual operating cost data for the fiscal year 2009-2010:

GWRS 2009-2010 Cost Summary (65,950 AFY) OCWD Net Costs						
	Treatment		Distribution		Total	
	Cost	$ / AF	Cost	$ / AF	Cost	$ / AF
Electricity	6,347,318	96	1,319,000	20	7,666,318	116
Chemicals	4,152,496	63	0	0	4,152,496	63
Labor	6,966,873	106	725,450	11	7,692,323	117
R&R Fund Contribution	3,904,866	59	910,134	14	4,815,000	73
Plant Maintenance	3,540,947	54	593,550	9	4,134,497	63
Operating Costs Subtotal	**24,912,500**	**378**	**3,548,134**	**54**	**28,460,634**	**432**
OCWD Debt Service	9,326,263	141	2,173,736	33	11,499,999	174
OCWD's Operating & Capital Subtotal	**34,238,763**	**519**	**5,721,870**	**87**	**39,960,633**	**606**
MWD LRP Subsidy	-7,374,942	-112	0	0	-7,374,942	-112
Demand Response Credit	-547,823	-8	-82,177	-1	-630,000	-10
OCSD contribution to maintenance (ended May 2010)	-416,667	-6	0	0	-416,667	-6
Operating Subsidies Subtotal	**-8,339,432**	**-126**	**-82177**	**-1**	**-8,421,609**	**-128**
OCWD Net Cost	**25,899,331**	**393**	**5,639,693**	**86**	**31,539,024**	**478**

GWRS 2009-2010 Cost Summary (65,950 AFY) Overall Project Gross Cost						
	Treatment		Distribution		Total	
	Cost	$ / AF	Cost	$ / AF	Cost	$ / AF
OCWD's Operating & Capital	**34,238,763**	**519**	**5,721,870**	**87**	**39,960,633**	**606**
OCSD Capital Contribution	10,340,250	157	2,409,750	37	12,750,000	193
Outside Grants	4,695,366	71	1,094,234	17	5,789,600	88
Outside Capital Funding	**15,035,616**	**228**	**3,503,984**	**53**	**18,539,600**	**281**
Project Total (Without Outside Funding or Subsidies)	**49,274,379**	**747**	**9,225,854**	**140**	**58,500,233**	**887**

Awards

The GWRS has received more than 35 awards, including the prestigious Stockholm Industry Water Award, which is the highest international honor bestowed upon water projects. Below is a current list of awards garnered for the project by OCWD and OCSD:

2009

- **United States EPA Clean Water State Revolving Fund "PISCES" Award**
  In recognition of projects that advance clean and safe water through exceptional planning, management and financing, awarded to the Groundwater Replenishment System.

- **American Society of Civil Engineers (ASCE) Outstanding Civil Engineering Achievement Award**
  Received for the year's most outstanding national engineering project, awarded to the Orange County Water District and Orange County Sanitation District for the Groundwater Replenishment System.

- **American Council of Engineering Companies (ACEC) Grand Conceptor Award**
  Signifies the year's best engineering achievement among the 168 national projects honored by the ACEC, awarded to the Orange County Water District.

- **American Council of Engineering Companies (ACEC) "Golden State" Award of Excellence**
  The highest California award offered by ACEC, awarded to the Groundwater Replenishment System.

- **Green California Leadership Award, Water Management**
  In recognition for efforts managing sparse water supplies in Southern California, awarded to the Orange County Water District.

- **International Ultraviolet Association UV Engineering Project of the Year Award**
  In recognition of the Groundwater Replenishment System for its innovation and vision, and lasting impact it has had as an example of how to integrate UV advanced oxidation technology into a water reclamation process train.

- **Said Khoury Award for Engineering Construction Excellence**
  Four engineers associated with the Groundwater Replenishment System received the award from the World Federation of Engineering Organizations. The engineers recognized were: OCWD Director Denis Bilodeau, P.E.; OCWD General Manager Mike Markus, P.E.; OCSD Director of Engineering Jim Herberg P.E., BCEE; and Richard Corneille, P.E., from CDM.

2008

- **Stockholm 2008 Industry Water Award**
  Prestigious international award received in recognition of pioneering work to develop the Groundwater Replenishment System, awarded to the Orange County Water District and Orange County Sanitation District.

- **Toshiba Green Innovation Award**
  The Orange County Water District and Orange County Sanitation District named winners for the Groundwater Replenishment System and their commitment to the environment.

- **Southern California Edison Savings By Design Award**
  The Orange County Water District and Orange County Sanitation District were recognized with six awards totaling $421,432 for energy-saving strategies that were incorporated into the design of the Groundwater Replenishment System.

- **United States EPA Water Efficiency Award**
  Recognition to the Orange County Water District for world leadership in wastewater purification for groundwater replenishment. Award given for technical success, especially for 10-year+ effort to educate the public.

- **Global Water Intelligence Award of Distinction, Water Project of the Year**
  In recognition of the Groundwater Replenishment System.

- **Global Water Intelligence Public Agency of the Year**
  Recognizes the public sector organization that made the greatest contribution to meeting the challenges of water supply during the previous year.

- **Association of California Water Agencies (ACWA) Clair A. Hill Award**
  The Orange County Water District is the only agency in California to receive this prestigious award more than once, having first won the award in 1993.

- **Orange County Coastkeeper Coastal Protection Award**
  In recognition of the Groundwater Replenishment System.

- **International Water Association (IWA) Honor Award, Design Projects**
  This global recognition is part of the IWA Project Innovation Program for Excellence in Innovative Water Engineering.

- **United States Congressional Recognition for Environmental Achievement**
  Presented by the U.S. House of Representatives, sponsored by Congress Member Loretta Sanchez (D, CA) in recognition of the Groundwater Replenishment System.

- **State of California Senate Special Recognition for Environmental Achievement**
  Sponsored by Senator Tom Harman for the Groundwater Replenishment System.

- **Groundwater Resources Association of California (GRA) 2008 Kevin J. Neese Award**
  Recognition to OCWD for its innovative groundwater management operations, particularly the development of the Groundwater Replenishment System.

- **California Special Districts Association (CSDA) Board President of the Year**
  In an unprecedented move, the CSDA co-awarded its Board President of the Year to two presidents: OCWD Board President Steve Sheldon and OCSD Board Chair Doug Davert because of the agencies' partnership constructing the Groundwater Replenishment System. It was the first time CSDA recognized two presidents in the same year for the award.

- **City of Huntington Beach Commendation for Environmental Achievement**
  In conjunction with the Orange County League of Conservation Voters, the commendation was presented to the Orange County Water District in recognition of the Groundwater Replenishment System.

- **Orange County League of Conservation Voters Special Recognition for Environmental Excellence Award**

- **American Society of Civil Engineers, Orange County Branch, Project of the Year**
  Presented to OCWD in recognition for the Groundwater Replenishment System.

- **Metropolitan Water District of Southern California (MWD) Resolution**
  OCWD was recognized with a Resolution commending it for the Groundwater Replenishment System.

- **Orange County Engineering Council Engineering Project of the Year**
  Award presented to the Orange County Water District for the GWRS.

2007

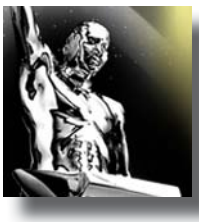
- **American Membrane Technology Association (AMTA) Outstanding Member Award**
  Award recognized OCWD and staff for the Groundwater Replenishment System.

- **Public Relations Society of America, Orange County Chapter (OCPRSA) Protos Award**
  The award was presented to the Orange County Water District in the category of "Editorial Article for a Trade Publication" for an article written for Pollution Engineering magazine about the Groundwater Replenishment System.

- **Public Relations Society of America, Orange County Chapter (OCPRSA) Award of Excellence**
  The award was presented to the Orange County Water District in the category of "Multicultural Outreach" for the Groundwater Replenishment System education and outreach campaign.

2006

- **Silver Anvil Award, Public Relations Society of America for Excellence in Community Relations Government**
  Award recognized OCWD, OCSD and Porter Novelli for the GWRS Community Outreach Program



2005

- **AWWA Public Communications Achievement Award**
  Award recognized OCWD and staff for the Groundwater Replenishment System Outreach Program

- **California/Nevada WateReuse Association Recycled Water Public Education program of the Year**
  Award recognized OCWD and OCSD for the GWRS Community Outreach Program

2004

- **MarCom Platinum Award**
  Award recognized OCWD and OCSD for the GWRS Community Outreach Program

- **National WateReuse Association Public Education Program of the Year**

- **Leadership Tomorrow Excellence in Community Leadership Award**

2003

- **Public Relations Society of America, Orange County Chapter PROTOS Award**
  Award recognized OCWD and Porter Novelli for the GWRS Community Relations Program

- **Santa Ana Watershed Project Authority Drought-Proofing Award**

Construction

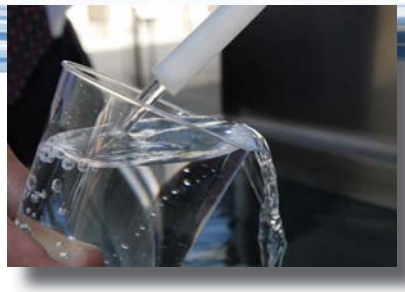
When OCWD was faced with continued problems of seawater intrusion, the initial solution was for OCWD to expand the seawater barrier and take more water from OCSD for injection. Yet, OCSD still faced the need for a second ocean outfall. The engineer's report determined that in order to meet OCSD's needs, OCWD would need to take significantly more water from OCSD.

An expanded barrier alone could not accommodate the amount of water that would be produced, so the critical decision was made to expand the program from being a seawater barrier project to a groundwater recharge project as well. In doing so, the agencies committed to an advanced water purification process to meet regulatory requirements.

The two agencies addressed separate challenges with a single solution and jointly agreed to construct a 70 million gallons (365,000 cubic meters) per day advanced water purification facility to treat wastewater to near-distilled-quality, providing OCSD with its peak wet weather relief and OCWD with a new source of ultra-pure water.

The first step towards implementing the project was to pilot test the treatment processes. In 1995, OCWD began pilot testing microfiltration, reverse osmosis and ultraviolet light with hydrogen peroxide to purify OCSD's highly treated wastewater. Testing results proved that this technology could purify the wastewater to near-distilled water quality.

Ultimately, the GWRS consisted of seven separate construction projects including an expanded seawater barrier and 13-mile pipeline to carry the water to recharge basins in Anaheim.



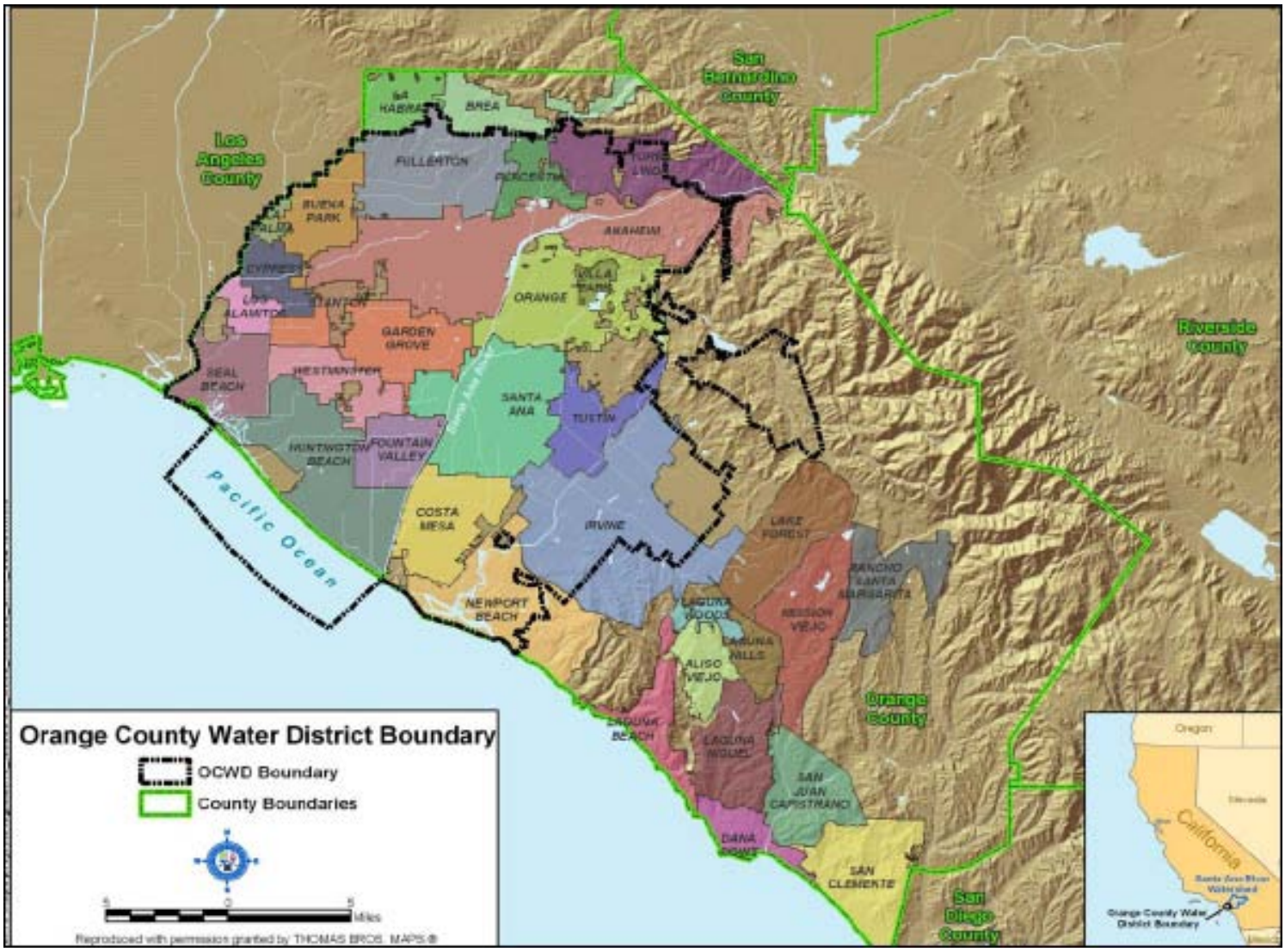
Below are some of the key project milestones:

- February 1997: OCWD/OCSD sign a cooperative agreement to plan and construct the GWRS
- March 1997: OCWD/OCSD established Joint Cooperative Committee (later changed to GWRS Steering Committee)
- March 1999: Environmental Impact Report final certification
- July 1999: Begin preliminary design of the GWRS projects
- September 2000: Receive approval of a $20 million grant from U.S. Bureau of Reclamation
- March 2001: OCWD/OCSD Boards of Directors authorize final approval to move forward and begin final design
- January 2002: Receive approval of a $37 million grant from Prop. 13 funding through Santa Ana Water Project Authority
- January 2002: Receive approval of a $5 million grant from State Water Resources Control Board
- July 2002: Receive approval of a $30 million grant from Prop. 13 funding through California Department of Water Resources
- November 2002: OCWD/OCSD Joint Development, Operation and Maintenance Agreement signed
- April 2003: Award $17.1 million 5 MGD Phase I GWRS Advanced Water Purification Facility
- November 2003: Final design of the GWRS project completed
- March 2004: Receive approval from California Department of Health Services and Santa Ana Regional Water Quality Control Board
- April 2004: Award $292.1 million contract to build 70 MGD facility
- April 2004: Award $12.6 million seawater barrier facilities expansion project
- June 2004: Receive approval of $85 million operations subsidy from Metropolitan Water District of Southern California Local Resources Program
- June 2004: Completed construction and started operation of 5 MGD Phase I Advanced Water Purification Facility
- January 2008: Completed construction and started operation of the GWRS

Project Area Population

2.4 million residents in north and central Orange County are served by the Orange County Water District. At its current capacity, the GWRS provides enough new water for nearly 600,000 residents. The region's population is expected to grow by more than 300,000 people by 2035 (Source: Cal State CDR).

Below is an OCWD service area map:



Orange County Water District (OCWD)

OCWD manages and protects the large groundwater basin underlying north and central Orange County. OCWD is a special district, not affiliated with the County of Orange or any city government. It was created by the California State Legislature in 1933 to protect Orange County's rights to Santa Ana River water and to manage the very large groundwater basin, which provides approximately 60% of the water needs for 2.4 million residents in the cities of Anaheim, Buena Park, Costa Mesa, Cypress, Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Irvine, La Palma, Los Alamitos, Newport Beach, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Tustin, Villa Park, Westminster and Yorba Linda. The mission of OCWD is to provide local water retailers with a reliable, adequate, high-quality water supply at the lowest reasonable cost in an environmentally responsible manner. To learn more about OCWD, please visit www.ocwd.com.

Orange County Sanitation District (OCSD)

OCSD operates the third largest wastewater agency west of the Mississippi River. For over 50 years, it has safely collected, treated and disposed of the wastewater generated by 2.4 million people living and working in central and northwestern Orange County. OCSD is a special district governed by a 25-member board of directors comprised of representatives of local sewering agencies and cities within its 470-square-mile service area. Each day, OCSD treats approximately 220 million gallons of wastewater - enough water to fill Angel Stadium nearly three times each day. About 80 percent of the wastewater comes from homes – sinks, toilets, showers, laundry, and dishwashers. The rest comes from businesses – retail stores, restaurants, manufactures, hotels, offices, and other industries.

OCSD facilities include 580 miles of sewer pipes that snake throughout the county and two treatment plants – one in Fountain Valley and the other in Huntington Beach – where wastewater is treated in accordance with strict state and federal standards 24 hours-a-day. For more information, visit the OCSD website at www.ocsd.com.

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